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Popular Mechanics

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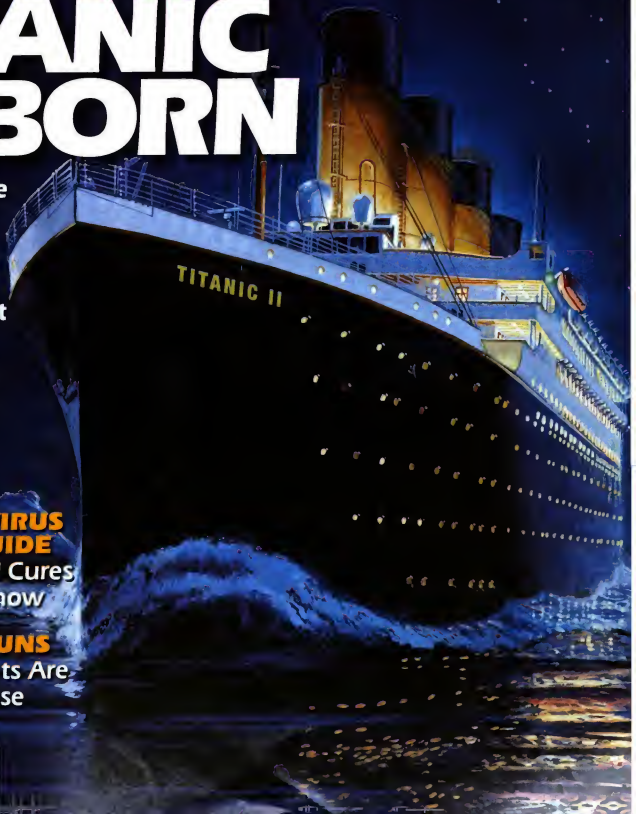

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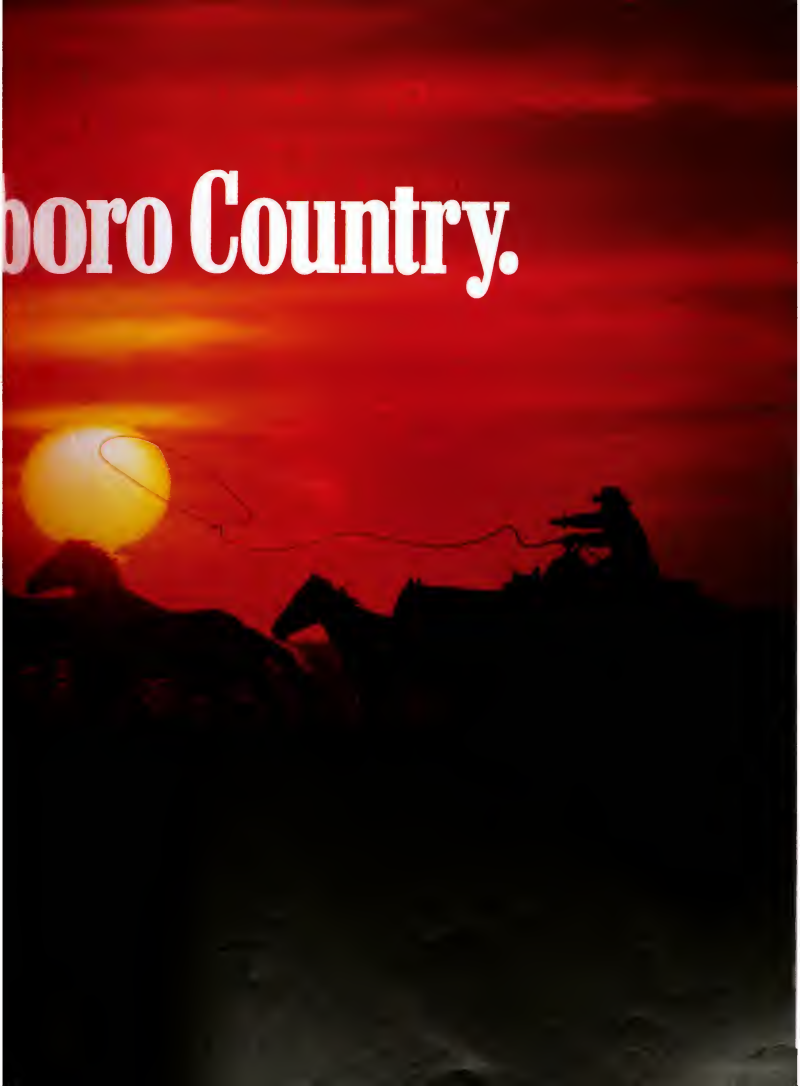
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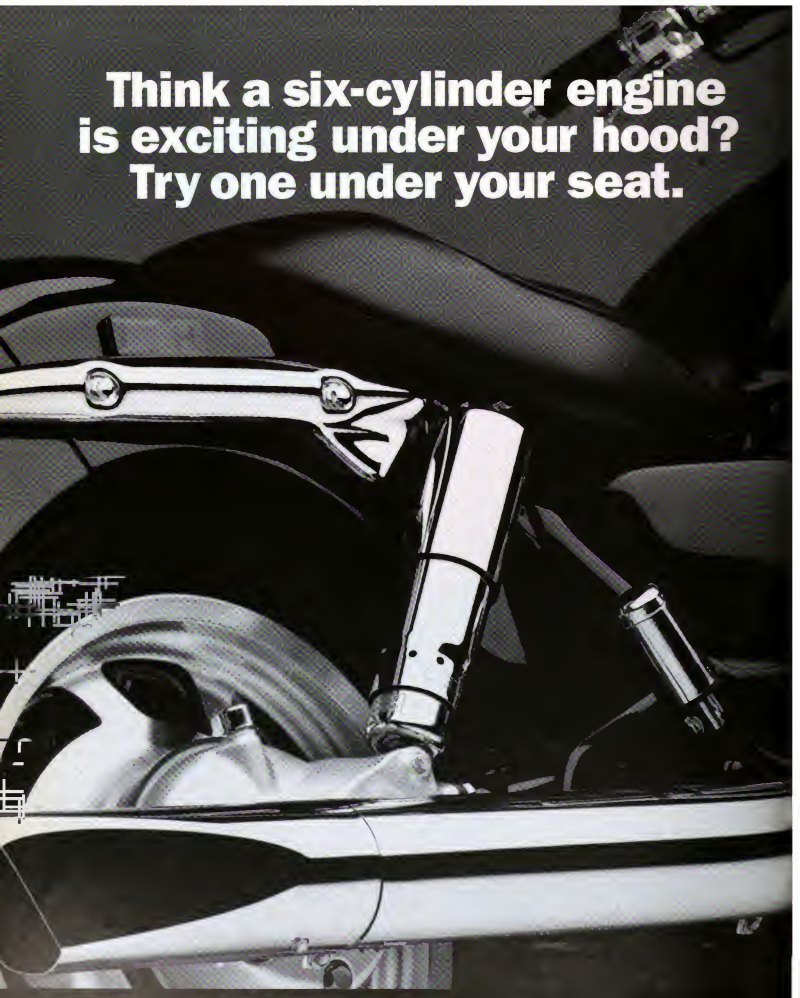

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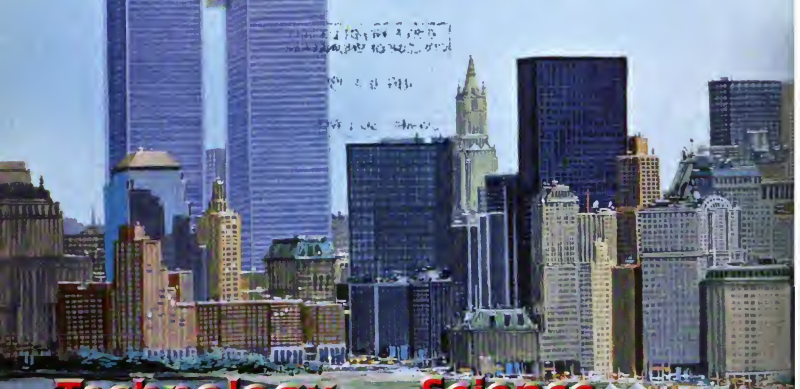
September

SEPTEMBER 1998, VOLUME 175, NO. 9



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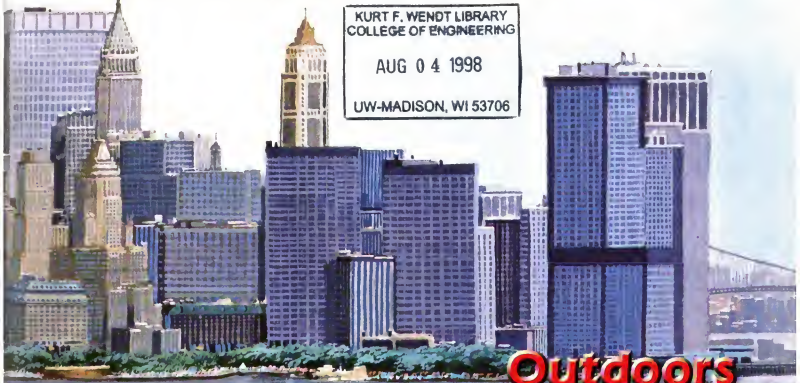

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New designs are lighter, stronger and easier to assemble.

88 Gun Locks
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An easy-to-build seat/storage bin that solves entryway seating problems.
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Editor's Notes

Technology Battles Hysteria

Technology Editor Grumet on the job.

Although she spends most of her time knee-deep in computers, camcorders and stereo components, Technology Editor Tobey Grumet has another beat too—photography. The time and space we give to photographic equipment pales by comparison to the attention we lavish on computers. Nonetheless, it's one of the areas we cover on a regular basis. Which is why Grumet recently found herself diving off the St. Croix and west Florida coasts to test the latest in cameras that take photos underwater. Packing the latest computerized controls for exposure and lighting, cameras for underwater photography have reached new levels of sophistication and ease of operation. Her full report begins on page 64. . . . **The *Titanic* hysteria continues.** Now not one but two new *Titanic*s are under construction or in the planning stages. These are bolt-for-bolt cosmetic replicas of the original except where modern safety regulations and shipbuilding protocol make that impossible. Under the skin, modern technology reigns and both ships will be as modern as anything sailing the seven seas. Our cover story tells all, beginning on page 56. And yes, there will be enough lifeboats for all on board. . . . **With the spate of school shooting tragedies** in recent months, it's more important than ever for those of us who own firearms to keep them safely out of reach of anyone not authorized to use them—especially children. Now, computer identification technology makes it easier than ever to keep guns in an unusable mode until you want to fire them. Our article on page 88 also highlights some good old-fashioned trigger locks that are low-tech but highly effective. Let's all make sure our guns are safely stowed *now*. . . . **In our office,** it's as if the bubonic plague has struck. The call goes out: "We've got a virus!" Oh no! The feared and hideous computer virus. It's funny, but it's not. A virus can knock out whole networks and that is no laughing matter when your business is idle while the geeks work out the problem. Beginning on page 72, Contributing Editor Kim Komando tells you not only how to cure your computer's "cold" but also how to prevent viruses from invading your system in the first place. . . . **Regular readers will remember** our article on the Army's new M4 rifle (Sept. '96, page 70). In that article, we said that the M4 would take the place of the M16 as the regular carry weapon for most U.S. forces. That's still true, but now we find that even the M4 is nothing more than an interim weapon. When the Army's next wonder weapon, code-named the Objective Individual Combat Weapon (OICW), is ready for operational status with U.S. forces, it will make the M4 look like the flintlock rifle carried by Washington's troops. For one thing,the OICW fires smart rounds that actually track targets around corners. For another, it will be the most lethal weapon ever carried by American soldiers. And it looks like something from a science fiction movie. It's truly the wildest thing you've ever seen, and you can check it out on page 60. . . . For those of you complaining to me that we don't run enough woodworking projects, you'll love the article beginning on page 90. Our boot bench is the answer to entryway seating problems and the storage compartment really will come in handy on those nasty El Niño evenings when everyone comes into the house with wet, snowy shoes. Till next time.

Joe Oldham

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Letters

The Truth Is Out There

This is a true story of a UFO sighting aboard a U.S. Navy aircraft carrier: In 1958, we were on a shakedown cruise when a small light followed our ship. The light came right at us, so close that you could see the shape of the object and that there were figures inside it. The figures weren't human beings. The object turned a bright red-orange and took off fast. The Navy kept the incident quiet. Years later, I found out about other sightings from that same ship. Witnesses had to sign papers to keep quiet and the ship deck logs don't show any record of the sightings. Why all these sightings from one ship? The *U.S.S. Franklin D. Roosevelt* was the first aircraft carrier armed with nuclear weapons. Could that have had something to do with it?

CHESTER GRUSINSKI
CLINTON TOWNSHIP, MI

The military has become expert at covering up the really good UFO events.

BRIAN DUMAS
EASTON, CT

I have a suggestion: Every six months, you should print six more equally credible UFO sightings.

DAVE WELDEN
IOWA FALLS, IA

I became interested in UFOs when I was 16, at a time when being interested in UFOs was mostly a male thing. Through the years, I have delighted in your articles and especially enjoyed your UFO cover story.

KATHY GILMER
KOUNTZE, TX

On your July cover, I was extremely disappointed to see the blurry apparition of a silver derby hat in a blue sky, which you claim to be a UFO. I do not believe in extraterrestrial life, especially that which is capable of creating something so advanced as a flying saucer and infiltrating our airspace unnoticed for more than 50 years.

CURTIS FARNHAM
ELKHORN, NE

The saucer in the Hillsdale photo is clearly a lens flare: Notice the sun through the tree, opposite and equally distant from the photo's center as the saucer is. The Sheraz saucer looks suspiciously like a satellite dish on a hidden building. The Zanesville saucer is also suspicious. Consider the difference in size and position of the saucer between the two photos. How did the photographer know it was going hang around that long?

LARRY SQUIRE
VIA INTERNET

The Plane Name

In your July issue, you referred to an F-51 Mustang. I believe you meant P-51.

ERICH HAEUSSER
BURLESON, TX

When the Army Air Corps officially became the U.S. Air Force in June 1947, the P (for Pursuit) designation was dropped and all aircraft with a P designation became designated as Fighters. The F-51 designation is correct for an incident taking place in 1948. —Ed.

Correction

● In the July '98 issue, the phone number listed for NetObjects was incorrect. The correct number is: 888-482-3200.

Letters are subject to editing for length, style and format.

Reader Project Of The Month

I built this playhouse for my eight grandchildren.

I constructed the six wall and floor panels flat on the deck and then tilted them up and secured them. The materials included 4 × 4 DF posts, ½-in. CDX painted plywood, 90# roll roofing and acrylic skylights. I used Pyrex pie dishes for windows.

The interior has a sink and 12-volt garden lighting. The size of the main area is 4 × 4 ft., with U-shaped wall panels projecting out 16 in. for the window seat bench inside. Total area is 32 sq. ft. for the house and 48 sq. ft. of decking.

GEORGE MOCK
SAN MATEO, CA

If your project is chosen as Reader Project Of The Month, you will receive a selection of Popular Mechanics/Wal-Mart tools as a token of our appreciation for sharing your project with us. For your project to be considered, please send a clear, color photo and brief description to: Reader Project Of The Month, Popular Mechanics, 224 W. 57th St., New York, NY 10019.

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Time Machine

90 Years Ago: September 1908

Bell And Whistle

Bigger is better when it comes to locomotives, and the Baltimore and Ohio railroad was installing these new monster engines for service west of the Allegheny Mountains. About twice the size of a standard locomotive, these behemoths of the roadbeds could pull four times the amount of freight. But before the engineer could cannonball down the line, several sections of roadbed, as well as several bridges, had to be reinforced to bear the engines' extra weight.

Foundry Fodder

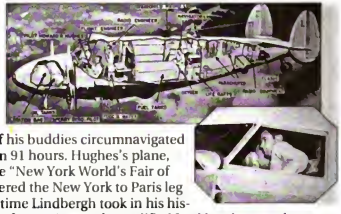
The modern equivalent of beating swords into plowshares and spears into pruning hooks took place at a Philadelphia foundry and machine works where old surplus cannons were recycled for more peaceful purposes. Weighing as much as 50,000 pounds, the cannons, all cast of high-grade steel, were broken up, melted down and recast into cooking utensils, gas and water pipe, piano wire, needles and pins, steel pens and even tin roofs for houses.

60 Years Ago: September 1938

Sky Car

Heralded as the "missing link in aviation," the autogiro—a wingless plane with three nonpowered overhead blades and a conventional propeller—was trumpeted (by the manufacturer) as the coming revolution in transportation. Able to land in areas previously accessible only to helicopters, the autogiro was touted as being adaptable to common land vehicles such as the family car. You merely pulled into a convenient empty lot and installed the rotor blades.

Globe Trotter



The world shrank considerably as Howard Hughes and four of his buddies circumnavigated the globe in 91 hours. Hughes's plane, dubbed the "New York World's Fair of 1939," covered the New York to Paris leg in half the time Lindbergh took in his historic flight of 1927. A secretly modified Lockheed monoplane that weighed in at 12½ tons, the Hughes aircraft was powered by twin 1100-horsepower supercharged engines and was able to hit 260 mph. The plane was equipped with the most elaborate radio system ever installed in a noncommercial plane, to keep in constant contact with headquarters in New York.

30 Years Ago: September 1968

Take A Deep Breath

How long can man live and work effectively in the depths of the ocean? The Navy's Sealab III project would involve sending five teams of aquanauts 600 ft. deep (three times deeper than any predecessors) for a total of 60 days. A virtual ocean-floor hotel and research laboratory, Sealab III was a huge steel cylinder resembling an outsize tank car. Sealab's goal was to open up vast areas of the ocean floor, an immense storehouse whose riches still lay untouched.

Gadgets Galore

Billed as the greatest gadget show on Earth, the annual International Inventors and New Products Exposition in New York City boasted more than 10,000 clever ideas, intriguing devices and far-out gimmicks. The snow skimmer, for example, used a 4-hp engine and an auger drive to pull you on your skis at 15 to 20 mph. And for tight parking spots, a Frenchman devised a new rack-and-pinion steering system that allowed the car's front wheels to pivot a full 90°. Too bad it was never perfected. PM

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Inflatable Houses On Mars

A lightweight residence for astronauts on Mars missions is taking shape in a cavernous hangar at NASA's Johnson Space Center (JSC) in Houston.

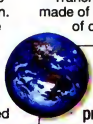
Called TransHab, the 37-ft.-tall, 25-ft.-dia. module would fold up for launch and later inflate like a balloon. It would give astronauts the unprecedented luxury of a private bedroom as they make the 6-month cruise to the red planet. Similar 12-ton modules sent earlier and inflated on the Martian surface would provide a temporary home (above).

TransHab would be made of alternating layers of ceramic fiber webbing and polyurethane foam, with reflective Mylar on the outside and bullet-stopping Kevlar on the inside. This 1-ft.-thick high-tech sandwich would protect the crew from micrometeorites better than metal, says Horacio de la Fuente, JSC's TransHab deputy manager.

Gaps in the foam layers would allow the shell to bend and shrink to fit inside the space shuttle's cargo bay, or inside the shroud of some yet-to-be-designed Mars rocket. Once in space, air would inflate the bladders to stiffen the outer shell.

Although NASA is years away from committing to a manned Mars mission, it is considering TransHab for use in Earth orbit. A decision on whether to fund the project as part of the International Space Station could come this fall.

Editor: Jim Wilson
Reporters: Stefano Coledan, Mike Filion, Cliff Gromer, Leslie Hicks, Barry Rosenberg, Bill Spence



September Highlights

Get Tough With Diamonds—New coating process will produce superhard tools.

■ **Entertaining Little Idea**—Trillions of molecule-size emitters to create realistic 3D TV.

■ **Plastic Tanks**—Steel looks strong, but polymers offer lighter combat protection.

Get Tough With Diamonds

Two limitations prevent the superhard surfaces created by amorphous or non-crystalline diamond films from being more widely used. Coatings can be applied only at high temperatures, and sometimes the coating peels off.

A new diamond application process developed by Tom Friedmann and John Sullivan of Sandia National Laboratories in Albuquerque, N.M., solves both problems. It uses a pulsed laser fired at a graphite target to apply ultrasmooth, superhard, thick coatings at room temperature.

Sandia says the coatings could lead to longer-lasting tools, car parts and biomedical implants.

RANDY MONTOYA/SANDIA NATIONAL LABORATORIES

Thick diamond films can now be deposited on a carbon substrate.

Asteroid Attack Alert System

Remember this spring's warning and subsequent retraction that an asteroid was headed for Earth? Well, get ready for a spate of similar false alarms announcing doomsday. It's not millennium madness, but a side effect of progress.

"Several telescope facilities and new instruments now coming online are expected to dramatically increase the discovery of asteroids and comets whose orbits approach Earth," says the National Research Council (NRC). With the flood of discoveries could come increased false alarms.

The NRC wants NASA and astronomers to form a committee to decide how much to tell the public during the days, weeks or even years between the time an object is first spotted and when it can be determined if it will pummel Earth.

Farmhand Robot

A French robot maker has found a new line of work for its iron-collar offspring: farming.

Robots find farm work more difficult than factory jobs. On an assembly line all of the same parts look the same. On a farm, variation among plants can overwhelm machine vision systems.

COVERPLANT ENGINEERING

The Coverplant transplanting robot, shown here, has a sufficiently sharp eye and delicate touch to transplant 5000 seedlings per hour.

Vineyard workers will be the first to share their fields with a robot wagon that hauls grapes during harvest.

Audi Picks Winning Designs

When Audi put out a call to young designers to show off their skills, the German automaker was overwhelmed. About 900 design teams from 49 countries submitted ideas for The Audi Design Award. A jury of world-famous designers selected 35 winners and gave their designers money to build prototypes. The best went on display at the recent Hanover Fair in Germany. Among PM's favorites:

Street Racer (top), which was submitted by a German design team, converts a rowing machine workout into a drive in the country. Pulling back the rowing handles spins the wheels. You steer with your feet and stop with a hydraulic brake.

Street Racer makes exercise a more useful pursuit.

Talker (right), another German entry, makes it possible to power cordless phones without batteries. Pulling the black ring sticking from the bottom of the phone spins an integrated generator, producing enough electric current to make a call.

Talker mobile phones could save millions of batteries.

Visual Voice (left), from the United States, makes imaginative use of electronics to break down barriers that isolate the hearing impaired. The bracelet senses hand motions as a person signs and converts them into electronic speech, using the belt-worn computer. The computer also converts spoken words into text, which is projected in front of the wearer's eyes.

Audi says it got more than good ideas from seeing the young designers' work. "The project opened our eyes that bit wider and has made us that touch younger," says Peter Schreyer, head of Audi design.

Visual Voice expands the world for the hearing impaired.

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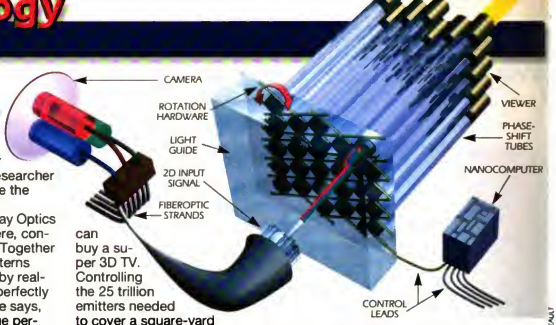
3D Viewing From Phased-Array Optics

Building from the molecular level up, nanotechnology researcher Brian Wowk hopes to create the perfect 3D viewing system.

His proposed Phased-Array Optics (PAO) system, illustrated here, consists of trillions of emitters. Together they would project light patterns identical to those reflected by real-world objects. PAO would perfectly replicate color and detail, he says, and the scene would change perspective as the viewer moved.

It may take some time before you can buy a super 3D TV. Controlling the 25 trillion emitters needed to cover a square-yard screen would require more computing power than now exists on Earth.



Highly detailed 3-dimensional images would form in front of tiny rotating tubes.

PAUL PERREAULT

Women Drivers Crash More

After boys, soccer moms are the drivers to avoid.

It comes as no surprise that teenage boys have more crashes per mile than teenage girls, about 20% more according to a comprehensive study of traffic accidents by Johns Hopkins University. This gap disappears between ages 20 and 35. Then, it reemerges in reverse. After age 35, women drivers are more likely to crash than men.

Women still win. Men who crash are three times more likely to get killed.

Bridges Keep Stretching

Akashi-Kaikyo Bridge (inset), which connects Kobe on Japan's main island of Honshu with the tiny island of Awaji, set three records in less than three months.

On April 5, the 2.4-mile span became the world's longest suspension bridge. Then, on June 14 it set a less proud record for so quickly losing that title. It was beaten by Denmark's Storebaelt Bridge, a 4.2-mile-long span that connects the country's biggest island, Sjaelland, to the mainland.

Akashi-Kaikyo Bridge did, however, manage to keep one record. Opened 84 years after it was proposed, it is probably the longest-to-complete bridge of this century. Now drivers can take it and a second bridge from Awaji to Shikoku, to travel between Japan's first and fourth largest islands in less than 2 hours.

AGENCY PRESS—PHOTO

Tiny Robots, Tiny Muscles

It's no exaggeration to call Boris (below) a wiry little critter. Power to move his insectlike legs comes from applying an electric current through Muscle Wires.

Made of a nickel-titanium alloy called Nitinol, Muscle Wires extend at room temperature. When heated they quickly contract. In pairs, they function like muscles and tendons in the human body. Stretched less than 5% of their length, Muscle Wires can flex more than a million times.

It's not just fun and games. A spokesman for Mondo-Tronics of San Rafael, Calif., says Muscle Wires could eventually squeeze out small motors and solenoids in tiny devices where weight and energy consumption are critical design considerations.

Boris demonstrates how Muscle Wires could replace motors.

MONDO-TRONICS INC

Silver Bullet For Vampire Fish

Researchers have found a silver bullet to kill the vampires of the Great Lakes.

With no predators, sea lamprey have devastated Great Lakes fish stocks.

U.S. FISH & WILDLIFE SERVICE

Sea lamprey earn their nickname by using their rasp-like tongues (below) to scratch through the scales and skin of fish. Once attached, they suck the life from their prey, including sea trout (left).

The lamprey hitchhike from the Mediterranean in the ballast water of ships. Young lamprey need salty water to mature, so if the population isn't replenished their numbers eventually may dwindle. Killing hitchhikers could save native fish.

Scientists at the University of Michigan say they could do this by adding 10 to 25 parts per million of an environmentally benign wart-removing compound called glutaraldehyde to the ballast water.

The only problem: At $260 to $900 per treatment, the lamprey-killing compound costs more than real silver bullets.

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Don't Call This Plastic Tank A Toy

UNITED DEFENSE

Plastic presents small radar signatures.

Tomorrow's real tanks may have something in common with today's toy tanks. They both may be made of plastic.

The 22-ton composite armored vehicle advanced technology demonstrator, or CAV-ATD, uses three types of plastic composites. Its upper hull is a sandwich of aluminum oxide armor tiles between layers of fiberglass-reinforced epoxy. The lower hull uses fiberglass and polyphenylene sulfide. And the 2-man crew capsule is made of fiberglass and phenolic resin.

Built by United Defense, the CAV-ATD is powered by a 552-cu.-in. diesel that gives it a 300-mile range, 30-mph cruising speed and 8-second 0-to-20-mph acceleration. A CAV-ATD armed with a 25mm Bushmaster gun is undergoing tests at the Aberdeen Testing Ground in Maryland. Plastic tanks could be fielded after 2005.

The robotic arm has a 9-ft. reach and accepts a variety of wrecking tools.

BROKK

Remote-Controlled Demolition

A tiny robot that hurls 100-ft.-lb. punches could be the biggest idea in demolition since dynamite.

Measuring about 2 × 3 × 4 ft., the Brokk MiniCut (above) is said to be the world's smallest demolition machine. "The idea behind the MiniCut is to eliminate the use of handheld jackhammers," says Mike Martin, the U.S. spokesman for Brokk, a Swedish equipment maker.

Weighing in at 794 pounds, MiniCut rides on rubber treads and can climb stairs and stacks of debris to enter confined spaces or areas too dangerous for human workers.

It may be a lightweight in demolition circles, but one man at the remote controls can do as much work as three men wielding 90-pound hammers.

Suture Practice

Limbs and Things, a British medical products manufacturer, has teamed up with sculptors to create ultrarealistic replicas of diseased and injured body parts for medical schools.

The anxious-looking faces are made of synthetic flesh so future surgeons can learn how to suture the soft tissue around the eyes. Give yourself an A if you recognized the moles as skin cancers.

DAVID MANSELL

Hot Plastic For Engines

JR. JR PHELON

Future jet engines could be more like plastic than steel.

"There are polymers that can sustain very high temperatures over short periods of time. What we don't know yet is how those materials perform over longer periods," says Samit Roy, of the University of Missouri-Rolla.

To determine if plastics really are a contender, Roy will test fiber composites (left) and develop mathematical models that predict how they might hold up after 15 years of use inside an engine.

Some answers could come after his testing program concludes next summer.

Street-Ready Fuel Cell Car

America's first street-ready fuel cell car has rolled out from the Schatz Energy Research Center (SERC) at Humboldt State University, in Arcata, Calif.

The 2-passenger vehicle uses the body and power train of a Danish neighborhood electric vehicle. SERC engineers removed its batteries and now power its 10-hp motor with a fuel cell that produces direct current by chemically combining hydrogen and oxygen to make water.

Although SERC's nonpolluting car is legal in Palm Desert, Calif., it can't go faster than 35 mph or farther than 30 miles without refueling.

Nevertheless, designer Peter A. Lehman has high hopes: "Our goal is to see full-size fuel cell vehicles running on all our nation's highways."

SERC's car packs only 10 horsepower.

A pill that helps men with erectile dysfunction respond again.

Naturally, the response has been positive.

Now there's a simple new pill for the treatment of erectile dysfunction (a common medical problem also called impotence).

VIAGRA® (sildenafil citrate) is a prescription pill that may help you achieve erections the natural way—in response to sexual stimulation. Ask your doctor if VIAGRA is the right step for you.

VIAGRA should not be taken by men who use drugs known as nitrates (most often used to control angina) in any form, at any time. Nitrates can reduce blood pressure to unsafe levels if used with VIAGRA. Be sure to talk to your doctor about any medications you take.

In clinical trials, VIAGRA was well tolerated. Some men experienced side effects, including headache, facial flushing, and upset stomach. A small percentage of men experienced mild and temporary visual effects. (See product information for more details.)

For more information, call 1-888-4VIAGRA or visit www.viagra.com.

VIAGRA®
(sildenafil citrate) tablets

Let the dance begin.

Please see brief summary of product information for VIAGRA (25-mg, 50-mg, 100-mg) tablets on the following page.

Let the dance begin.

Brief summary of prescribing information

VIAGRA® (sildenafil citrate) tablets

INDICATION AND USAGE

VIAGRA is indicated for the treatment of erectile dysfunction. The studies that established benefit demonstrated improvements in success rates for sexual intercourse compared with placebo.

CONTRAINDICATIONS

Use of VIAGRA is contraindicated in patients with a known hypersensitivity to any component of the tablet. Consistent with its known effects on the nitric oxide/cGMP pathway (see CLINICAL PHARMACOLOGY), **VIAGRA was shown to potentiate the hypotensive effects of nitrates, and its administration in patients who are concurrently using organic nitrates in any form is therefore contraindicated.**

PRECAUTIONS

General

A thorough medical history and physical examination should be undertaken to diagnose erectile dysfunction, determine potential underlying causes, and identify appropriate treatment.

There is a degree of cardiac risk associated with sexual activity; therefore, physicians may wish to consider the cardiovascular status of their patients prior to initiating any treatment for erectile dysfunction.

Agents for the treatment of erectile dysfunction should be used with caution in patients with anatomical deformation of the penis (such as angulation, cavernosal fibrosis or Peyronie's disease), or in patients who have conditions which may predispose them to priapism (such as sickle cell anemia, multiple myeloma, or leukemia).

The safety and efficacy of combinations of VIAGRA with other treatments for erectile dysfunction have not been studied. Therefore, the use of such combinations is not recommended.

VIAGRA has no effect on bleeding time when taken alone or with aspirin. *In vitro* studies with human platelets indicate that sildenafil potentiates the antiaggregatory effect of sodium nitroprusside (a nitric oxide donor). There is no safety information on the administration of VIAGRA to patients with bleeding disorders or active peptic ulceration. Therefore, VIAGRA should be administered with caution to these patients.

A minority of patients with the inherited condition retinitis pigmentosa have genetic disorders of retinal phosphodiesterases. There is no safety information on the administration of VIAGRA to patients with retinitis pigmentosa. Therefore, VIAGRA should be administered with caution to these patients.

Information for Patients

Physicians should discuss with patients the contraindication of VIAGRA with concurrent organic nitrates.

The use of VIAGRA offers no protection against sexually transmitted diseases. Counseling of patients about the protective measures necessary to guard against sexually transmitted diseases, including the Human Immunodeficiency Virus (HIV), may be considered.

Drug Interactions

Effects of Other Drugs on VIAGRA

***In vitro* studies:** Sildenafil metabolism is principally mediated by the cytochrome P450 (CYP) isoforms 3A4 (major route) and 2C9 (minor route). Therefore, inhibitors of these isoenzymes may reduce sildenafil clearance.

***In vivo* studies:** Cimetidine (800 mg), a non-specific CYP inhibitor, caused a 56% increase in plasma sildenafil concentrations when co-administered with VIAGRA (50 mg) to healthy volunteers.

When a single 100 mg dose of VIAGRA was administered with erythromycin, a specific CYP3A4 inhibitor, at steady state (500 mg bid for 5 days), there was a 182% increase in sildenafil systemic exposure (AUC). Stronger CYP3A4 inhibitors such as ketoconazole, itraconazole or mibefradil would be expected to have still greater effects, and population data from patients in clinical trials did indicate a reduction in sildenafil clearance when it was co-administered with CYP3A4 inhibitors (such as ketoconazole, erythromycin, or cimetidine). It can be expected that concomitant administration of CYP3A4 inducers, such as rifampin, will decrease plasma levels of sildenafil.

Single doses of antacid (magnesium hydroxide/aluminum hydroxide) did not affect the bioavailability of VIAGRA.

Pharmacokinetic data from patients in clinical trials showed no effect on sildenafil pharmacokinetics of CYP2C9 inhibitors (such as tolbutamide, warfarin), CYP2D6 inhibitors (such as selective serotonin reuptake inhibitors, tricyclic antidepressants), thiazide and related diuretics, ACE inhibitors, and calcium channel blockers. The AUC of the active metabolite, N-desmethyl sildenafil, was increased 62% by loop and potassium-sparing diuretics and 102% by non-specific beta-blockers. These effects on the metabolite are not expected to be of clinical consequence.

Effects of VIAGRA on Other Drugs

***In vitro* studies:** Sildenafil is a weak inhibitor of the cytochrome P450 isoforms 1A2, 2C9, 2C19, 2D6, 2E1 and 3A4 (IC50 >150 μM). Given sildenafil peak plasma concentrations of approximately 1 μM after recommended doses, it is unlikely that VIAGRA will alter the clearance of substrates of these isoenzymes.

***In vivo* studies:** No significant interactions were shown with tolbutamide (250 mg) or warfarin (40 mg), both of which are metabolized by CYP2C9.

VIAGRA (50 mg) did not potentiate the increase in bleeding time caused by aspirin (150 mg).

VIAGRA (50 mg) did not potentiate the hypotensive effect of alcohol in healthy volunteers with mean maximum blood alcohol levels of 0.08%.

No interaction was seen when VIAGRA (100 mg) was co-administered with amlodipine in hypertensive patients. The mean additional reduction on supine blood pressure (systolic, 8 mmHg; diastolic, 7 mmHg) was of a similar magnitude to that seen when VIAGRA was administered alone to healthy volunteers (see CLINICAL PHARMACOLOGY).

Analysis of the safety database showed no difference in the side effect profile in patients taking VIAGRA with and without anti-hypertensive medication.

Carcinogenesis, Mutagenesis, Impairment of Fertility

Sildenafil was not carcinogenic when administered to rats for 24 months at a dose resulting in total systemic drug exposure (AUCs) for unbound sildenafil and its major metabolite of 29- and 42-times, for male and female rats, respectively, the exposures observed in human males given the Maximum Recommended Human Dose (MRHD) of 100 mg. Sildenafil was not carcinogenic when administered to mice for 18-21 months at dosages up to the Maximum Tolerated Dose (MTD) of 10 mg/kg/day, approximately 0.6 times the MRHD on a mg/m² basis.

Sildenafil was negative in *in vitro* bacterial and Chinese hamster ovary cell assays to detect mutagenicity, and *in vitro* human lymphocytes and *in vivo* mouse micronucleus assays to detect clastogenicity.

There was no impairment of fertility in rats given sildenafil up to 60 mg/kg/day for 36 days to females and 102 days to males, a dose producing an AUC value of more than 25 times the human male AUC.

There was no effect on sperm motility or morphology after single 100 mg oral doses of VIAGRA in healthy volunteers.

Pregnancy, Nursing Mothers and Pediatric Use

VIAGRA is not indicated for use in newborns, children, or women.

Pregnancy Category B. No evidence of teratogenicity, embryotoxicity or fetotoxicity was observed in rats and rabbits which received up to 200 mg/kg/day during organogenesis. These doses represent, respectively, about 20 and 40 times the MRHD on a mg/m² basis in a 50 kg subject. In the rat pre- and postnatal development study, the no observed adverse effect dose was 30 mg/kg/day given for 36 days. In non-pregnant rats the AUC at this dose was about 20 times human AUC. There are no adequate and well-controlled studies of sildenafil in pregnant women.

ADVERSE REACTIONS

VIAGRA was administered to over 3700 patients (aged 19-87 years) during clinical trials worldwide. Over 550 patients were treated for longer than one year.

In placebo-controlled clinical studies, the discontinuation rate due to adverse events for VIAGRA (2.5%) was not significantly different from placebo (2.3%). The adverse events were generally transient and mild to moderate in nature.

In trials of all designs, adverse events reported by patients receiving VIAGRA were generally similar. In fixed-dose studies, the incidence of some adverse events increased with dose. The nature of the adverse events in flexible-dose studies, which more closely reflect the recommended dosage regimen, was similar to that for fixed-dose studies.

When VIAGRA was taken as recommended (on an as-needed basis) in flexible-dose, placebo-controlled clinical trials the following adverse events were reported.

TABLE 1. ADVERSE EVENTS REPORTED BY ≥2% OF PATIENTS TREATED WITH VIAGRA AND MORE FREQUENT ON DRUG THAN PLACEBO IN PRN FLEXIBLE-DOSE PHASE II/III STUDIES

Adverse Event	Percentage of Patients Reporting Event	
	VIAGRA N=734	PLACEBO N=725
Headache	16%	4%
Flushing	10%	1%
Dyspepsia	7%	2%
Nasal Congestion	4%	2%
Urinary Tract Infection	3%	2%
Abnormal Vision[1]	3%	0%
Diarrhea	3%	2%
Dizziness	2%	1%
Rash	2%	1%

[1] Abnormal Vision: Mild and transient, predominantly color tinge to vision, but also increased sensitivity to light or blurred vision. In these studies, only one patient discontinued due to abnormal vision.

Other adverse reactions occurred at a rate of >2%, but equally common on placebo: respiratory tract infection, back pain, flu syndrome, and arthralgia.

In fixed-dose studies, dyspepsia (17%) and abnormal vision (11%) were more common at 100 mg than at lower doses. At doses above the recommended dose range, adverse events were similar to those detailed above but generally were reported more frequently.

No cases of priapism were reported.

The following events occurred in < 2% of patients in controlled clinical trials; a causal relationship to VIAGRA is uncertain. Reported events include those with a plausible relation to drug use, omitted are minor events and reports too imprecise to be meaningful.

Body as a whole: face edema, photosensitivity reaction, shock, asthenia, pain, chills, accidental fall, abdominal pain, allergic reaction, chest pain, accidental injury

Cardiovascular: angina pectoris, AV block, migraine, syncope, tachycardia, palpitation, hypertension, postural hypotension, myocardial ischemia, cerebral thrombosis, cardiac arrest, heart failure, abnormal electrocardiogram, cardiomyopathy

Digestive: vomiting, glossitis, colitis, dysphagia, gastritis, gastroenteritis, esophagitis, stomatitis, dry mouth, liver function tests abnormal, rectal hemorrhage, gingivitis

Hemic and Lymphatic: anemia and leukopenia

Metabolic and Nutritional: thirst, edema, gout, unstable diabetes, hyperglycemia, peripheral edema, hyperuricemia, hypoglycemic reaction, hypernatremia

Musculoskeletal: arthritis, arthrosis, myalgia, tendon rupture, tenosynovitis, bone pain, myasthenia, synovitis

Nervous: ataxia, hypertonia, neuralgia, neuropathy, paresthesia, tremor, vertigo, depression, insomnia, somnolence, abnormal dreams, reflexes decreased, hyperesthesia

Respiratory: asthma, dyspnea, laryngitis, pharyngitis, sinusitis, bronchitis, sputum increased, cough increased

Skin and appendages: urticaria, herpes simplex, pruritus, sweating, skin ulcer, contact dermatitis, exfoliative dermatitis

Special senses: mydriasis, conjunctivitis, photophobia, tinnitus, eye pain, deafness, ear pain, eye hemorrhage, cataract, dry eyes

Urogenital: cystitis, nocturia, urinary frequency, breast enlargement, urinary incontinence, abnormal ejaculation, genital edema and anorgasmia.

OVERDOSAGE

In studies with healthy volunteers of single doses up to 800 mg, adverse events were similar to those seen at lower doses but incidence rates were increased.

In cases of overdose, standard supportive measures should be adopted as required. Renal dialysis is not expected to accelerate clearance as sildenafil is highly bound to plasma proteins and it is not eliminated in the urine.

HC150R98

VIAGRA® (sildenafil citrate) tablets

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'Smart' Endotracheal Tube

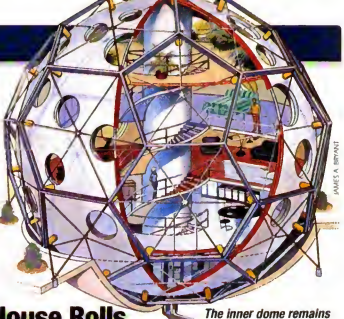
Using the same ultrasound technology that enables expectant parents to see their future children, a group of University of Rochester researchers has developed a "smart" oxygen delivery tube.

The system also warns if tubes jar loose.

Its developers say it can prevent fatal heart or brain injuries that occur when oxygen is pumped into the stomach instead of the lungs. This can happen if a tube is improperly inserted or if it shifts.

A pencil-eraser-size ultrasound transducer attaches to the bottom of the foot-long endotracheal tube. If the tube is mistakenly placed in an unconscious patient's esophagus, the signal is blocked by the air in the trachea. A receiver mounted on the front of the patient's throat then sounds a warning signal.

The university is seeking a corporate partner to mass-produce the smart tubes. Researchers say they could sell for slightly more than $7 each, plus $50 to $100 for reusable receivers.



JAMES A. BRYANT

House Rolls If Earth Shakes

The inner dome remains level regardless of how the skeleton shifts.

The EQR Biosphere knows how to take a punch. It will roll during earthquakes that topple most structures.

"EQR consists of a sphere within a sphere," developer Curtis R. Noble, of Pocatello, Idaho, told PM. "Rather than sitting on a foundation, it sits in a nest carved out of the Earth and tied down with cables."

In a mild earthquake, shock absorbers prevent forces from being transmitted into the inner shell. In a major quake a computer disconnects breakaway utility lines and activates a motor that automatically relevels the structure.

Noble estimates that 2500-sq.-ft. structures like the one shown above could be built for about $120,000.

Low-Energy Ice Zapper

The first major advance in wing-ice removal in 15 years may soon be installed on the Lancair Columbia 300 4-seat aircraft.

Conventional heaters and air bladders remove ice by melting and fracturing the buildup.

The electro-expulsive separation system (EESS) uses a photoflash-like power supply to send a brief burst of high-current electricity through two parallel layers of copper ribbon bonded to ice-prone surfaces. The shock causes the upper ribbon to jump. This shatters the ice into harmless table-salt-size particles, says inventor Leonard Haslim, of NASA's Ames Research Center in Moffett Field, Calif.

Commercial jets may someday adopt the technology. "I think that once it is working on a small aircraft, engineers will realize it will work well with larger airplanes too," says EESS developer Haslim.

Ultralight Makes Lakes Runways

Boaters and jet bikers will soon have to watch out for air traffic.

PM took a ride on the GTE 582S at the Sun 'n' Fun airshow in Florida.

French ultralight manufacturer Air Creation has introduced the GTE 582S, the first practical ultralight seaplane. The secret to its performance is the shape of its floats. They are designed to reduce drag by rapidly rising out of the water.

Powered by a Rotax 582 engine, the tiny $28,000 water bird sips about 2 gallons an hour from its 15.6-gal. tank while cruising at 55 mph with only its pilot aboard. Fully loaded it can carry a pilot and passenger or one person and 200 pounds of gear.

LESLIE PACKS

X-Rays In Orbit

A 25-watt X-ray that generates a beam comparable to one created by a 5-kilowatt system will allow astronauts to study crystals grown aboard the proposed International Space Station.

Developer Bede Scientific Instruments of Durham, England claims the unit's small size (below) will also make it less expensive for Earthbound labs to perform X-ray analysis.

The unit owes its small size to a magnetically focused X-ray tube and sophisticated optical package.

JOEL PATTISON

KAMAN AEROSPACE

High-Flying Trash Pickup

Rather than dismantle a string of 5070-pound electric transmission towers, a Norwegian utility arranged for a heavy-lift helicopter to remove each 98-ft.-tall structure fully assembled.

"The K-MAX Aerial Truck has been used to construct transmission towers," says Steven Daniels, who manages Kaman Aerospace's commercial aircraft operation. "This is the first time it's been used to take them down."

MR. PAYROLL

Paycheck Cashier Machine

A new type of cash machine will let you fire your bank. Many people are forced to spend hundreds of dollars a year on checking account fees so they can cash their paychecks. Mr. Payroll machines (left) are the first automatic teller machines to cash checks and money orders from anyone. When a person registers, a centralized security system memorizes his facial features. Later, when he presents a check he only has to type in his Social Security number and look the camera in the eye.

After the successful completion of a 10-state test, the machines will be installed nationwide. In the future the machines will help you spend your money too. Planned upgrades will let customers buy money orders and tickets to entertainment events—for a fee, naturally.

Self-Inflating Rescue Boat

CLIFF GROMER

Air pressure creates enough rigidity to eliminate the need for a wood floor.

Folded, the G380 fits in a pickup bed or an SUV cargo bay.

Inflatable boats are nifty, unless all the huffing and puffing gives you a heart attack. The Zodiac G380 inflatable helps you avoid a 911 call by blowing itself up.

It packs its own compressed air supply in a scuba cylinder. Turn a valve and in less than 3 minutes the 105-pound package blossoms into a 12½-ft. boat.

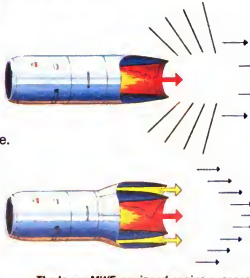
Since it requires neither a trailer nor launching ramp, the $6945 inflatable really comes into its own as a quick-response boat. While it is blowing itself up, emergency teams can begin loading rescue gear.

Air Muffler For Jets

Jet engines on future fleets of supersonic airliners could be made quieter by using a simple new type of muffler.

Called a Mach wave eliminator (MWE), it injects a stream of air into a jet engine's exhaust before it comes in contact with the surrounding airspace. This "coflow" injection creates a virtual shroud around the engine's exhaust, thus preventing the creation of excessive noise, says developer Dimitri Papamoschou, of the University of California at Irvine. In tests his team found that their noise elimination system could actually increase engine thrust.

Like many other technological leaps, MWE was discovered partly by accident. Papamoschou was studying how to suction out Mach waves when he wondered what would happen if he applied the process in reverse and added air. "I just decided to try it and the results were quite spectacular," he says.



The lower MWE-equipped engine encases jet exhaust with a wall of air that prevents the formation of eddy currents which contribute to creating ear-shattering jet noise.

Sick Of TV

"Pokemon," a children's cartoon show that sent 200 Japanese viewers to hospital emergency rooms after they suffered video-induced seizures, will debut in America this month.

Researchers narrowed the cause to a 20-cycle blue-light strobe effect, which producers say has now been edited out.

The episode was not the first time entertainment had literally driven people out of their minds. In the late 1960s, a National Institute of Neurological Diseases and Blindness study linked rare forms of epilepsy with listening to Tommy Dorsey's rendition of "String of Pearls."

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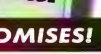

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GARY REYES/SAN JOSE MERCURY NEWS

Heat Repairs Shoulders

A new surgical technique can simplify the repair of shoulder separations.

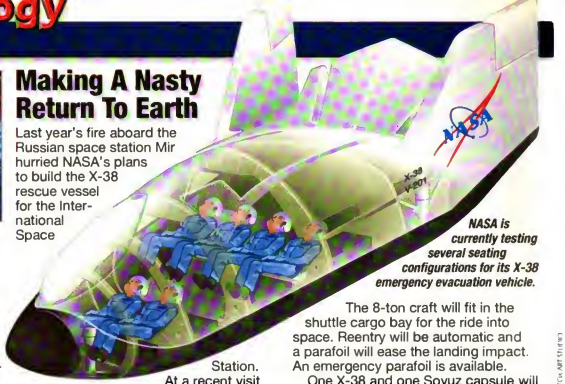
A needle-like instrument called an ElectroThermal Arthroscope (ETA) is inserted into the damaged area, as shown, above, in a demonstration with a cadaver. Activated, the ETA bathes the region with radio-frequency energy that heats the tissue to 150° F, at which point collagen shrinks. This tightens the ligaments to promote faster healing.

"In traditional surgery we cut something," says Gary Fanton, an associate professor at Stanford University who helped develop ETA technology. "Now we can change the structure of collagen. This is only the tip of the iceberg."

Making A Nasty Return To Earth

Last year's fire aboard the Russian space station Mir hurried NASA's plans to build the X-38 rescue vessel for the International Space Station. At a recent visit to the Johnson Space Center in Houston, PM spotted engineers assembling the fuselage of the first X-38 orbiter.

Two Russian-built Soyuz capsules initially will serve as space station escape vessels, but each can carry only three crew members. The X-38 can carry everyone in one trip.



NASA is currently testing several seating configurations for its X-38 emergency evacuation vehicle.

The 8-ton craft will fit in the shuttle cargo bay for the ride into space. Reentry will be automatic and a parafoil will ease the landing impact. An emergency parafoil is available.

One X-38 and one Soyuz capsule will be permanently docked to the space station by 2003, says project manager Brian Anderson. NASA says development and construction of four X-38s will cost $740 million. NASA plans to test fly the pod unmanned in late 2000.

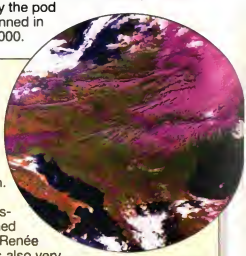
PAUL WEIGHT/NASA

Sharper Eyes For Spot

Spot Image's new Spot 4 spacecraft will allow landscapes to be interpreted better than ever.

The improved imagery is the result of equipping the satellite with detectors that "see" in the short-wave infrared radiation (SWIR) band and instrumentation dedicated to studying vegetation.

"The SWIR band is better able to see through the Earth atmosphere," explained spokesperson Renée Saunders. "It is also very sensitive to soil and plant moisture content, making it easier to distinguish soil types and plant growth stages."



Spot 4 clearly distinguishes between clouds and snow.

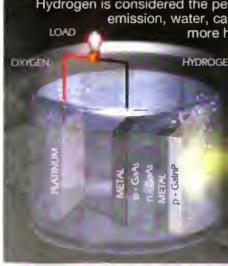
SPOT IMAGE

Hydrogen From Solar Cells

A new type of semiconductor material can split water into hydrogen and oxygen directly from sunlight.

Developed by the National Renewable Energy Laboratory (NREL) in Golden, Colo., it produces hydrogen twice as efficiently as electrolysis, which uses electricity to split molecules.

Hydrogen is considered the perfect fuel because its only emission, water, can be recycled to make more hydrogen.



The cell, made of platinum, gallium arsenide (GaAs) and gallium indium phosphide (GaInP), is not efficient enough for commercial use, but NREL believes its output will improve as the device is fine-tuned.

No Proof ETs Pilot UFOs

The most detailed study of UFOs since the 1968 Condon Report discounts the possibility that mysterious aircraft are piloted by extraterrestrials or powered by engines that violate natural laws.

Scientists from the United States, France and Germany reached this conclusion after examining what ufologists consider the best physical evidence of UFOs. Radar sightings were attributed to "ducting," a rare natural phenomenon that produces "mirages" on radar screens, says retired Stanford University professor Von R. Eshleman, the group's spokesman. Visual observations were likely sightings of secret military aircraft.

Check the PMZone for a link to the report. PM

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Outdoors

Tent Futures

BY JIM GORANT

Tensegrity I with the storm flaps rolled up. The arch of intersecting triangles is held in place by tension.

The word 'tensegrity' is an invention: a contraction of 'tensional integrity.' Tensegrity describes a structural-relationship principle in which structural shape is guaranteed by the finitely closed, comprehensively continuous, tensional behaviors of the system and not by the discontinuous and exclusively local compressional member behaviors. Tensegrity provides the ability to yield increasingly without ultimately breaking.

R. Buckminster Fuller
Synergetics, 1975

That's easy for him to say. Of course, Fuller was the genius architect-philosopher who invented the geodesic dome, the Dymaxion Car and the concept of Spaceship Earth, so to him, that probably seemed like simple English.

CAMPING

For the rest of us, tensegrity is not so easy to understand, nevermind verbalize. Yet this concept of structural support has been used to build edifices as grand as the Georgia Dome and as simple as a child's toy. That's probably why 36 years after Fuller patented tensegrity, its wonders have escaped almost everyone except architects, engineers and infants.

Now one group of architects and engineers has used tensegrity to build a new toy, and they hope it will bring the benefits of tensegrity to grown-ups, at least outdoors-loving ones.

Sierra Designs has built Tensegrity I, a prototype tent incorporating this revolutionary technology. This tent is lighter, stronger, more resilient and easier to assemble than comparable tents. And you don't even need an engineering degree to use it.

Good Tension

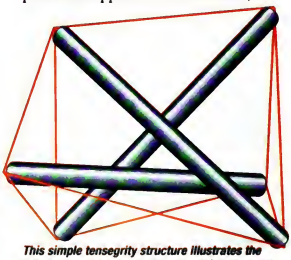
Basically, tensegrity is a structure that's held together by tension.

Most structures, like houses and skyscrapers, are built on principles of compression. The skeleton is a rigid lattice of beams, posts and girders connected by equally rigid fasteners. The building relies on the structure and the strength of the materials to resist forces such as weight, torque and lateral pressure.

If those forces become too great, the house or office building will fail catastrophically. In other words, if a hurricane hits your house, it's either going to stand up to it or fall down. There's not much in between.

A tension structure uses compression elements but ties them together with *tension* elements like cables or wires. In tensegrity, Fuller imagined a system in which the compression elements "floated" inside tension elements in a series of interlocking triangles. In this arrangement, the compression elements provide only separation between the tension elements and thereby maintain the tension.

It is the constant tension between the compression elements that bears the load of outside forces. No matter how much pressure is applied from the outside, the



This simple tensegrity structure illustrates the play between tension and compression elements.

tensile strain on the compression elements is limited.

Moreover, the tension and compression elements in tensegrity are arranged so that as the outside pressure surpasses the static strength of the structure, the entire structure moves. While this changes the outer shape of the structure and reduces the tension in some areas, the system maintains its overall tension. So when the outside stress is removed the structure returns to its original shape.

The greater the pressure, the more the system gives without failing—indefinitely. This means that a tent built with tensegrity might have less initial strength, but it would have greater resilience.

Dome Sweet Dome

It's ironic that the current height in tent design, the one that tensegrity could potentially displace, is based on Fuller's own geodesic dome technology. The benefit of geodesic design, according to Fuller, was "maximum space for minimum materials." But while geodesic tents are strong and light, they require two long poles that can be awkward and fragile. Also, since the poles are bent, they don't compress uniformly under stress.

For Fuller, tensegrity was the natural evolution of the "more for less" idea. Sierra Designs has compressed the tensegrity principle into an arch—a slice of intersecting triangles that are integrated into the roof of the tent. The compression elements are hollow aluminum tubes that never bend, and the tension elements are shock cords run through the middle of the tubes.

The arch takes the place of traditional tent poles. And since none of the 12 sections of tubing is longer than 19½ in., they all sit neatly inside the folded tent. In order to pitch the tent you just slide the tubes along the shock cords until they connect. Then you stake down the sides of the tent in a prescribed order and it snaps to form. Tighten down the toggles and you have a perfect dome tent.

If you lean on the tent, the arch bends. The more you lean, the more it deforms—while still maintaining a habitable structure. Not only that, but the more you lean on it the harder it pushes back, and as soon as you let up, it jumps back into shape.

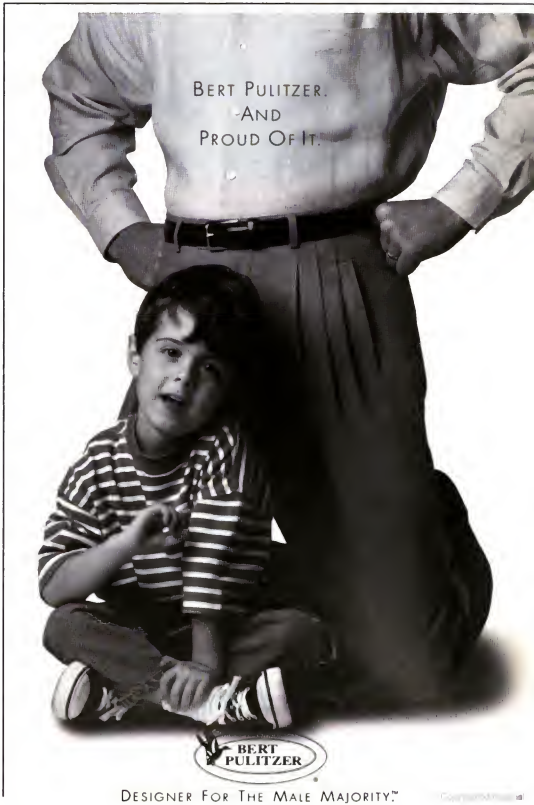
What Else?

The tent has two doors for access and ventilation, and floor and ceiling vents create a chimney effect if desired. Storm flaps create two 4-sq.-ft. vestibules for extra weather protection. You can roll up the flaps, leaving only the streamlined tent exposed to the wind.

When it's time to go you simply unstake the tent in reverse order and fold it up into itself, everything—stakes, cords, ropes—condensing into one small (16 in. long), light (5 pounds, 11 ounces) package.

The only downside to tensegrity will be the initial cost. But as the technology becomes more commonplace, even the price should become more attractive. For now, Sierra Designs can't say when Tensegrity I will be on the market. Perhaps 1999. However, it's also possible that the company will forgo manufacturing the first version and skip to the second, which it's working on now.

Either way, keep your eye out for tensegrity tents. They're the shape of the future. PM



Automotive

Reports From Around The World

PHOTO BY JIM McCRAW

1999 Mercedes-Benz CLK320 Cabriolet

Take a highly successful sports coupe, outfit it with a power convertible roof and you're as certain as you can be that you have a winner. That's the formula Mercedes-Benz follows with the new 1999 model CLK320.

But it's not as simple as that. The Cabriolet model has a number of basic changes that produce a solid, shake-free body, a convenient top-up and top-down power operation and a hushed interior—one that rivals the low noise levels of the coupe. As with other ragtops from Mercedes, the car has a pop-up rollbar, in the form of rear-seat headrests, to offer more protection in the event of a rollover.

NEW CARS

The 4-passenger Cabriolet weighs about 370 pounds more than the coupe, thanks to its additional structure and chassis vibration dampeners. The almost fully automatic top takes 30 seconds to open and stow itself. In the United States, it's available only with a 3.2-liter V6 and 5-speed automatic. Expect to pay "in the high $40,000 range" for the pleasure of owning one of these CLK320 Cabriolets. *—Jim Dunne*

1999 Chevrolet Corvette Hardtop

If you've been jonesing for a new Vette, but the cookie jar is just a few bucks short and your insurance company blew a fuse when you called for a rate because they've paid off millions of dollars in claims on stolen Corvette T-tops, there's hope. Complementing the T-topped coupe and roadster, the '99 Vette is available in a less expensive spread. This new fixed-roof variation has been decontended. Pricing wasn't set at press time, but bet it'll be a bunch more than a Camaro, yet still more affordable than a coupe. It'll come with Goodyear Eagle F1 run-flat tires on 17-in. front and 18-in. rear wheels. The only transmission will be the skip-shift 6-speed manual. Other options new for all Corvettes in '99 include a power telescoping steering wheel and a head-up display that reflects the speedo, tach and other gauges onto the windshield. *—Mike Allen*

1999 Ford F-150/250

Still the champ, the under 8500-GVW Ford F-150/250 pickups get freshened with new grilles—a honeycomb style for 4wds and an egg-crate treatment for 2wds—and a new front bumper. Ford has made the 4-door standard on all SuperCabs and becomes the first manufacturer to offer 4-door pickups across its complete model lineup. Better still, the optional 5.4 Triton V8 gets 25 more horsepower, up to 260 hp, and 15 ft.-lbs. more torque for a total of 345. The extra power was found by improving engine breathing. Cylinder heads received some additional porting and slight modification of valve-seat geometry. The intake valve remains the same, but the exhaust valve is increased in size by 1mm. The cam profile also is modified with higher acceleration ramps. Exhaust manifolds have a more efficient swept shape.

1999 FORD F-150/250

PHOTO BY JIM McCRAW

The biggest factor in increasing the torque was the elimination of the split intake—a system that remains on the 4.6-liter V8. Trashing the communication valve inside the intake

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plenum and sealing up the area eliminated the double hump curve of the '98 design and picked up torque considerably. There was also some port-matching on the intake manifold.

On the Silver Creek torture test track at Ford's Arizona Proving Grounds, the '99 F-150 proved far superior in ride and control to '98 Chevy and Dodge models. One reason for the F-150's good handling is a unique rear suspension that reduces rear-axle tramp, especially in soft-sand 4wd conditions. The rear frame rails are curved inward slightly, which bends the rear leaf spring. This causes the spring to twist (like a torsion bar) in addition to flexing. The rear mount of the spring is higher than the front mount, which causes the outside wheel to move forward slightly in a corner, giving a 4-wheel steering effect.

—Cliff Gromer

1999 Chevrolet Camaro Z28 SS

Chevy's Z28 SS does great burnouts—but a single exhaust?

The smokey burnout is becoming a lost art. Soon the widespread evils of front-wheel drive and traction control will make obnoxious, sideways smokies impossible. No more rear tires spewing white smoke and hot rubber. That day will be a dark one, but thanks to cars like the Chevrolet Camaro Z28 SS the apocalypse is not yet here. The SS cooks its rear Goodyears as effortlessly as Julia Child cooks beef bourguignon.

Powered by a 320-hp version of the Corvette's all-aluminum LS1 5.7-liter V8, the SS is the most powerful Camaro you can buy. The 350 V8, which makes 345 ft.-lbs. of torque, works with a short shifting 6-speed manual transmission and a limited-slip solid rear axle with 3.42 gears, making this one of the quickest Camaros of all time. It runs the quarter-mile in the mid-13s at over 100 mph. Our test car cost $27,810—nothing you can buy for less is quicker.

The soundtrack that accompanies the SS is pure '60s musclecar: V8 rumble, squealing tires, rubber in second—but no '60s musclecar coddled its occupants the way the SS does. Power amenities are abundant, ABS and traction control are standard—our car even had a CD player, icy a/c and an agreeable highway ride.

The SS package, which is available on coupes and convertibles, also includes 17-in. 5-spoke wheels, 40-series tires, that menacing hood scoop, a larger rear spoiler and get this: a single, uno, solo, lone, individual, solitary 3-in. exhaust tip. Not two. Not four. One. Why? Because some bean counter in some boardroom figured out on his little calculator that one tailpipe is cheaper than two? Whatever. Now the world has a 13-second, tire shredding Camaro with a single tailpipe. A sillier scenario we can't think of, especially when a less powerful Z28 still gets twin pipes and a V6 Monte Carlo gets four. *—Scott Oldham*

1999 Toyota Camry Solara

Folks who drive coupes are different from folks who drive sedans. And they want you to know the difference. They say coupes are for sporty drivers. Sedans are for the practical person. Those trusty marketing concepts led Toyota to build a distinctive 2-door version of the Camry, a car that at first glance tells you it's clearly not a quick-baked version of the sedan.

The styling of the Camry Solara is, in the sporty tradition, nothing akin to that of the Camry sedan. Body lines are more defined, the grille is more aggressive in shape and taillights are planned as much for strong visual appeal as for signalling. Inside the cabin, visual impact drops off. Solara's instrument panel has the appearance of many Japanese sedans'. Instruments are aligned directly in front of the driver, while radio and heater controls are stacked in the center of the panel, at the front of the center console. Large doors on this coupe allow easy access to rear seats, access made easier still by two stiff holsters that swing the front shoulder belts out of the way when you need entrance space. Toyota reports that Solara's interior room is "nearly equal to the Camry sedan." While the car is rated for 5-passenger capacity, the small center seat in the rear is not recommended for comfort on any but short drives.

In the Toyota tradition, the V6 engine/4-speed transmission combination is silky smooth, producing no hint of gear whine nor valve-train clatter. Structurally, extra strength comes from cross-braced struts under the hood and a reinforced transom panel behind the rear seats. For a more sporty ride, front and rear spring rates are faster while the rear suspension mounts are stiffer. In comparison with the

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So instead of going back and forth trying to decide which is the best blade to buy, just pick up a set of Bosch Micro Edge Excel wiper blades. Call **1-888-TOP-BLADE** for a retailer near you.

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BOSCH

sedan, power steering effort is heavier and quicker, in the tradition of sporty coupes.

Two engines, a 135-hp Four and a 200-hp V6, are offered in two model lines, the Solara SE and Solara SLE. Standard equipment includes a/c, tilt, cruise control, power windows and locks. As an option, side airbags are available. There's a choice of a 5-speed manual and 4-speed automatic, as well.

Prices will run from under $20,000 to mid- or high-$20,000 levels. —*J.D.*

1999 Infiniti G20

Despite having its heinie handed to it repeatedly by cross-town rival Lexus, Infiniti just keeps going. And it's now going where Lexus isn't, to the sub-$25,000 price point. The G20 has existed before, from 1991 to 1996. It was a car praised for its quality and handling, but chastised for its high price and lack of power.

Well, this new G20, designed to get younger and poorer folks into the Infiniti fold, retains its predecessors' strong points, and at $21,000 to $25,000, it's definitely priced better. Unfortunately, the same engine remains, and with it the horsepower issue. With only 140 hp, the peaky 2.0-liter was too weak two years ago, and it's still too weak now.

However, keep the revs up and there's little problem. From 5000 rpm to its 7000 rpm redline, the dohc Four moves the little sedan with pocket-rocket vitality. And thanks to a new 4-point cross-engine mount system, the aging all-aluminum engine, which has no balance shafts, feels remarkably refined. But the motor's bottom end is weaker than the Bulls without Jordan, especially when compared to the 1.8-liter turbo you get in a base Audi A4, the G20's main competitor.

Handling has long been a G20 forte, and it still is. This front-wheel-drive sedan is fun to toss around and its beam axle rear suspension keeps the G's tail planted in all situations, even in the wet. Other positives include the largest interior in its class, with much more rear legroom than the Audi, and a precise and perfectly geared 5-speed manual transmission. The 4-speed automatic shifts smoothly enough, but it saps power the engine can't spare. —*S.O.*

DETROIT SPY REPORT

BY JIM DUNNE

1999 Ford Mustang Cobra

Look closely and you'll see some differences in front fascia between this Cobra version of the 1999 Mustang and the standard issue ponycar. Larger, unique-design wheels, more intricate intake grilles and unique hood scoops will make this car look different. Chassis changes include an independent rear suspension (finally!). A supercharged 4.6-liter V8 may also be available.

1999 FORD MUSTANG COBRA

2001 Cadillac Roadster

Don't call it a sports car. Cadillac could pull a surprise and bring out a small sporty convertible as a 2001 model. Cadillac calls it a roadster. The plans call for a slightly larger version of the Corvette, but with its own aluminum body and Northstar engine/transmission. No, this is not another Allanté, that ill-fated, 1980s Cadillac front-drive convertible that did little to enhance Cadillac's image as a progressive carmaker. This time, Cadillac insiders think they have it right. Rear-wheel drive, high performance and styling more formal than sporty are the features that Cadillac thinks will carry the prestige of a Mercedes-Benz SL model.

2000 Pontiac Bonneville

General Motors has scheduled a redesign of the Pontiac Bonneville in model year 2000. According to reports from inside the industry, Bonneville will undergo a complete change in chassis, styling and drivetrain. From the outside, if this photo of a prototype car is an indicator, Bonneville will retain its current styling cues, including a split grille opening at the front and a notched border of the rear quarter window. Windshield posts will present a more severe angle. Headlights will be round, projector types. Bonneville's chassis will be an adaptation of the GM's W type, now used in the Seville and soon to be shared with Olds's Aurora 6/8 and Buick's LeSabre. Under the hood is GM's newest V6 engine, the so-called

2000 PONTIAC BONNEVILLE

OFFICIAL TRUCK OF NASCAR

Courage.

Teamwork.

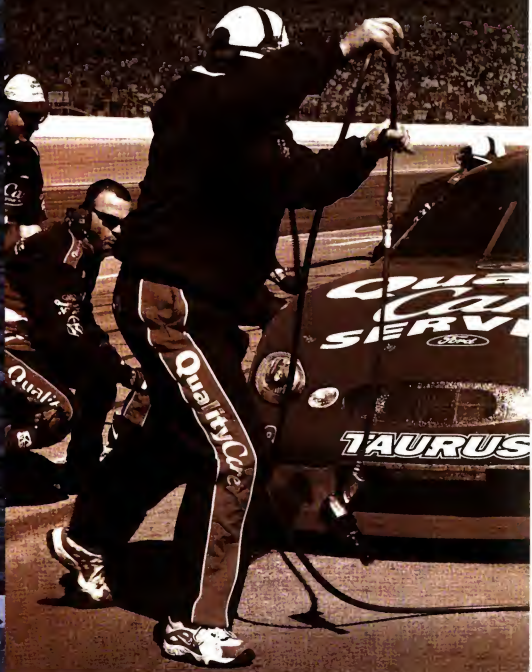
Hope.

Education.

Gratitude.

Passion.

All in 16.84 seconds.



Blink during a NASCAR race and you risk missing the thrill of a lifetime. Of course, in a world that moves at 200 mph, we tend to work fast. At Ford, we're not about to slow down for anyone, but we do want to invite you in for a closer look. Into a sport where an entire work week is squeezed into a Sunday afternoon. And where our greatest success goes beyond the finish line. So get in tight with Ford Racing. But do it quickly.

Ford

WE RACE. YOU WIN.™

Ford Crew

www.ford.com

If you're ready to quit smoking

OFF WITH THE PATCH...

ON TO THE NICOTINE-FREE PILL

ZYBAN beat the #1 prescription patch[1]

ZYBAN has been proven more effective than a nicotine patch

In a medical study using patient support materials and drug therapy, ZYBAN helped more smokers quit for 4 weeks than Habitrol® (nicotine transdermal system),* a nicotine patch. And unlike the patch and gum, ZYBAN replaces cigarettes with nicotine-free medicine.

You can break free from smoking

If you've tried to quit before and are still smoking, ask your health care professional about nicotine-free ZYBAN. It's a pill. Prescription medicine that can help reduce your urge to smoke and make quitting bearable.

What you need to know about ZYBAN

The most common side effects with ZYBAN include dry mouth and difficulty sleeping. Although uncommon, there is a risk of seizure associated with ZYBAN. (See "Important Warning" section in Information for the Patient on following page.) So it is important to talk to your health care professional to see whether ZYBAN is right for you. You should not take ZYBAN if you have a seizure disorder; are already taking WELLBUTRIN®, WELLBUTRIN SR®, or any other medicines that contain bupropion HCl; have or have had an eating disorder; or are currently taking or have recently taken a monoamine oxidase (MAO) inhibitor. It is important to let your health care professional know about any other prescription or over-the-counter medications you are taking. ZYBAN is not recommended for women who are pregnant or breast-feeding.

SEE YOUR HEALTH CARE PROFESSIONAL ABOUT ZYBAN

ZYBAN and the ZYBAN Advantage Plan™, a free counseling and personalized support program, are part of an overall plan recommended by your health care professional to help you quit smoking.

For more information, call **1-888-959-STOP (7867) ext. 49** or visit our Web site at www.zyban.com

BREAK FREE FROM NICOTINE
BREAK FREE FROM SMOKING

NICOTINE-FREE
ZYBAN™
bupropion HCl sustained-release tablets 150 mg

Reference: 1. Scott-Levin Source Prescription Audit (SPA) 9/97.

* Habitrol is a registered trademark of Ciba-Geigy Corporation.

Please consult Information for the Patient on the following page.

Information for the Patient

ZYBAN™ (bupropion hydrochloride) Sustained-Release Tablets

Please read this information before you start taking ZYBAN. Also read this leaflet each time you renew your prescription, in case anything has changed. This information is not intended to take the place of discussions between you and your doctor. You and your doctor should discuss ZYBAN as part of your plan to stop smoking. Your doctor has prescribed ZYBAN for your use only. Do not let anyone else use your ZYBAN.

IMPORTANT WARNING:

There is a chance that approximately 1 out of every 1,000 people taking bupropion hydrochloride, the active ingredient in ZYBAN, will have a seizure. The chance of this happening increases if you:

- have a seizure disorder (for example, epilepsy);
- have or have had an eating disorder (for example, bulimia or anorexia nervosa);
- take more than the recommended amount of ZYBAN; or
- take other medicines with the same active ingredient that is in ZYBAN, such as WELLBUTRIN® (bupropion hydrochloride) Tablets and WELLBUTRIN SR® (bupropion hydrochloride) Sustained-Release Tablets. (Both of these medicines are used to treat depression.)

You can reduce the chance of experiencing a seizure by following your doctor's directions on how to take ZYBAN. You should also discuss with your doctor whether ZYBAN is right for you.

1. What is ZYBAN?

ZYBAN is a prescription medicine to help people quit smoking. Studies have shown that more than one third of people quit smoking for at least 1 month while taking ZYBAN and participating in a patient support program. For many patients, ZYBAN reduces withdrawal symptoms and the urge to smoke. ZYBAN should be used with a patient support program. It is important to participate in the behavioral program, counseling, or other support program your health care professional recommends.

2. Who should not take ZYBAN?

You should not take ZYBAN if you:

- have a seizure disorder (for example, epilepsy).
- are already taking WELLBUTRIN, WELLBUTRIN SR, or any other medicines that contain bupropion hydrochloride.
- have or have had an eating disorder (for example, bulimia or anorexia nervosa).
- are currently taking or have recently taken a monoamine oxidase inhibitor (MAOI).
- are allergic to bupropion.

3. Are there special concerns for women?

ZYBAN is not recommended for women who are pregnant or breast-feeding. Women should notify their doctor if they become pregnant or intend to become pregnant while taking ZYBAN.

4. How should I take ZYBAN?

- You should take ZYBAN as directed by your doctor. The usual recommended dosing is to take one 150-mg tablet in the morning for the first 3 days. On the fourth day, begin taking one 150-mg tablet in the morning and one 150-mg tablet in the early evening. Doses should be taken at least 8 hours apart.
- **Never take an "extra" dose of ZYBAN.** If you forget to take a dose, do not take an extra tablet to "catch up" for the dose you forgot. Wait and take your next tablet at the regular time. Do not take more tablets than your doctor prescribed. This is important so you do not increase your chance of having a seizure.
- It is important to swallow ZYBAN Tablets whole. Do not chew, divide, or crush tablets.

5. How long should I take ZYBAN?

Most people should take ZYBAN for 7 to 12 weeks. Follow your doctor's instructions.

6. When should I stop smoking?

It takes about 1 week for ZYBAN™ (bupropion hydrochloride) Sustained-Release Tablets to reach the right levels in your body to be effective. So, to maximize your chance of quitting, you should not stop smoking until you have been taking ZYBAN for 1 week. You should set a date to stop smoking during the second week you're taking ZYBAN.

7. Can I smoke while taking ZYBAN?

It is not physically dangerous to smoke and use ZYBAN at the same time. However, continuing to smoke after the date you set to stop smoking will seriously reduce your chance of breaking your smoking habit.

8. Can ZYBAN be used at the same time as nicotine patches?

Yes, ZYBAN and nicotine patches can be used at the same time but should only be used together under the supervision of your doctor. Using ZYBAN and nicotine patches together may raise your blood pressure. Your doctor will probably want to check your blood pressure regularly to make sure that it stays within acceptable levels.

DO NOT SMOKE AT ANY TIME if you are using a nicotine patch or any other nicotine product along with ZYBAN. It is possible to get too much nicotine and have serious side effects.

9. What are possible side effects of ZYBAN?

Like all medicines, ZYBAN may cause side effects.

- The most common side effects include dry mouth and difficulty sleeping. These side effects are generally mild and often disappear after a few weeks. If you have difficulty sleeping, avoid taking your medicine too close to bedtime.
- The most common side effects that caused people to stop taking ZYBAN during clinical studies were shakiness and skin rash.
- Contact your doctor or health care professional if you have a rash or other troublesome side effects.
- Use caution before driving a car or operating complex, hazardous machinery until you know if ZYBAN affects your ability to perform these tasks.

10. Can I drink alcohol while I am taking ZYBAN?

It is best to not drink alcohol at all or to drink very little while taking ZYBAN. If you drink a lot of alcohol and suddenly stop, you may increase your chance of having a seizure. Therefore, it is important to discuss your use of alcohol with your doctor before you begin taking ZYBAN.

11. Will ZYBAN affect other medicines I am taking?

ZYBAN may affect other medicines you're taking. It is important not to take medicines that may increase the chance for you to have a seizure. Therefore, you should make sure that your doctor knows about all medicines—prescription or over-the-counter—you are taking or plan to take.

12. Do ZYBAN Tablets have a characteristic odor?

ZYBAN Tablets may have a characteristic odor. If present, this odor is normal.

13. How should I store ZYBAN?

- Store ZYBAN at room temperature, out of direct sunlight.
- Keep ZYBAN in a tightly closed container.
- Keep ZYBAN out of the reach of children.

This summary provides important information about ZYBAN. This summary cannot replace the more detailed information that you need from your doctor. If you have any questions or concerns about either ZYBAN or smoking cessation, talk to your doctor or other health care professional.

GlaxoWellcome

Glaxo Wellcome Inc.
Research Triangle Park, NC 27709

U.S. Patent Nos. 5,427,798 and 5,358,970

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RL-425

Automotive

"Shortstar," a 3.5-liter version of Cadillac's 4.6-liter Northstar V8. Look for the new Bonneville to go on display in Pontiac showrooms in late spring 1999.

PHOTO BY NICHOLAS A. TICHE

2000 Ford Excursion

When parked next to what some folks already consider a huge vehicle, say Ford's Crown Victoria, the Ford Excursion is Godzilla-size. In fact, insiders at Ford refer to the Excursion as a "Crew Wagon." Looking at this prototype it's easy to see why: It appears as though it could easily hold a crew of eight or nine. Excursion's front end appears to be a direct copy of the Ford F-350 heavy-duty pickup trucks.

ASIA SPY REPORT

BY SCOTT OLDHAM

2001 Mazda Sport Utility

It might look like a shrunken version of Mazda's MPV minivan, but under that disguise is a car-based mini-SUV that will compete with the hot-selling Toyota RAV4 and Honda CR-V. Which car is it based on? Some say the new 626 platform, but that has not been confirmed.

PHOTO BY NICHOLAS A. TICHE

2001 MAZDA SPORT UTILITY

The project is a joint Mazda/Ford effort that will supply each brand with a version of the little truck. In Ford's lineup, it will slot under the 2-door Explorer Sport, while at Mazda it will be the brand's only SUV, and its first since Mazda stopped selling the Navajo version of the Explorer back in '95. Both Mazda and Ford versions will be built in America, and there's talk of Ford's 3.0-liter V6 making it onto the option lists of both, which would give them an advantage over the 4-cylinder-powered Honda and Toyota, and continue a trend started by the just-released V6-powered Suzuki Grand Vitara. Look for the little SUV at Mazda dealers in the summer of 2000 as a 2001 model.

1999 Hyundai Sonata

We've tracked its progress through numerous test mules and numerous spy shots, but the newly designed Hyundai Sonata is finally done, and it's almost here. The car is larger than its predecessor, and it certainly looks better. The Sonata's height and width are identical to the Camry's, while its wheelbase is an inch longer than the Toyota's and its overall length is 3 in. shy of the Camry's. Powered by an all-new 170-hp V6, the Sonata is aimed at the heart of the midsize sedan market. Features include a roomier interior, better ergonomics and equipment such as traction control, ABS and 4-wheel independent suspension. The Sonata will hit rental fleets first this fall and Hyundai dealers in the early spring.

2000 Hyundai Minivan

Hyundai has no minivan and no SUV. In today's truck-heavy U.S. market, that's bad. Hyundai knows what it needs to do, so it's hard at work on two trucks simultaneously. This spy shot of the minivan shows four doors, sleek styling and odd corner windows like the ones you'll find on Honda's Odyssey van. The Hyundai won't be huge, its dimensions are similar to Mazda's MPV—which means it's much shorter than a Toyota Sienna.

This unnamed people-mover is based on the new Sonata platform and shares that car's 170-hp V6. Inside, Hyundai has gone with a column shifter so there's room between the front seats. If Hyundai's parent company had its way, this van would be at U.S. dealers in a year, but the stagnant minivan market has Hyundai North America wanting an SUV first. That truck is also based on the Sonata platform, and will also feature the company's new V6. The mini-SUV, which will be offered in front- and 4-wheel-drive versions, should outrun the 4-cylinder-powered Toyota RAV4 and Honda CR-V. Like the van, it will cost between $15,000 and $20,000. PM

PHOTO BY AUTO BILD

Science

Global Warming Wildcard

BY JIM WILSON

PHOTO BY JEFF DIONNE/ICON COMMUNICATIONS

Sunspots may have helped El Niño create this year's monster waves.

METEOROLOGY

Professional surfer

Terrence McNulty eyed the 50-ft. waves crashing on Todos Santos, an island off Baja California, and rendered a learned opinion: "If they get any bigger, I don't want to be in the event." Nevertheless, McNulty stayed to compete in this year's Reef Big Wave Team World Championship. He even won a trophy—the prize for the most dramatic wipeout.

Surfers from Australia to northern California thanked El Niño for the monster waves that made 1998 the best surfing season of the century. This periodic warming of ocean currents certainly had a lot to do with it. But recent discoveries about the Sun suggest a climatic wildcard also could be at play. Good surfing years track with another natural phenomenon—sunspots, the blemishes that for three centuries have been observed to pockmark the brilliant face of the Sun.

The number of sunspots rises and falls over an average 11-year period (above). One hint of a sunspot-climate connection is that when the Sun is most spotted, its total energy output is about 0.1% greater than during the sunspot minimums.

A second hint is what happens when sunspots virtually disappear. This occurred most recently between 1645 and 1715, when the Sun became as blemish-free as a *Cosmo* cover girl. Astronomers call this 70-year interval the "Maunder minimum." Climatologists have another name for it: "the Little Ice Age." During these frigid decades Dutch canals froze. Alpine glaciers advanced down canyons. And farmers bemoaned long, severe winters and short, wet summers.

Scientists still remained cautious about drawing a connection. "We have only the 11-year sunspot record for the last 300 years to link directly to today's Sun, and we don't have direct measurements of the radiation before the 1970s," says Peter Fox, of the National Center for Atmospheric Research (NCAR), in Boulder, Colo.

However, while surfers were being pummeled, conventional wisdom that downplayed the sunspot-climate link was taking a beating of its own, at the 1998 meeting of the American Association for the Advancement

of Science (AAAS) in Philadelphia.

Harry van Loon of NCAR and Karin Labitzke of the Free University of Berlin offered the best statistical evidence yet that sunspots are the driving force behind a 10- to 12-year oscillation in temperature in the lower stratosphere. The stratosphere extends from about 6 to 15 miles above sea level. Temperatures are very, very cold but also stable.

Icy Connection

The case for a connection was strengthened by Brian A. Tinsley, of the University of Texas at Dallas. At the AAAS meeting, he explained a theoretical multistep process that begins when solar activity associated with sunspots intensifies the solar wind—electrically charged particles thrown out by the Sun.

On contact with the Earth's magnetic field, these particles trigger a cascade of lower-energy ions. Eventually, these charged particles hit droplets of water that make up high-altitude clouds. "At cloud tops the droplets are generally supercooled, that is, at a temperature below freezing but still liquid," Tinsley told the AAAS conference. "A minute quantity of energy input can trigger freezing, as in cloud seeding." As the liquid water making up the clouds turns to ice, the clouds themselves become thinner, reflecting less of the Sun's energy back into space. The net result is a rise in temperature.

NASA is stepping up its investigations. Its Office of Earth Science will soon begin evaluating proposals for the Total Solar Irradiance Mission (TSIM), an orbiting instrument package designed to monitor variations in the amount of radiant solar energy that reaches Earth.

As a result, answers to the centuries-old mystery of a sunspot-climate connection should come relatively soon. "TSIM will be developed in 36 months or less," says Dr. Ghassem Asrar, NASA associate administrator for Earth science.

TSIM's most important contribution may be to help the scientific community decide if the sunspot wildcard should be dealt in the global warming debate. If there is a strong sunspot-climate relationship, the notion that global warming is caused primarily by a buildup of carbon dioxide and other "greenhouse" gases could wipe out as dramatically as the surfers in Baja. PM

We hope you'll raise a glass to Mr. Jack Daniel sometime this month. Any day you choose will be just fine.

EVERY SEPTEMBER, someone in Lynchburg, Tennessee bakes Mr. Jack Daniel a birthday cake. (This year, it was Margaret Tolley's turn.)

Trouble is, no one knows for sure just when Mr. Jack's birthday occurs. Nobody has ever been able to hunt down the exact date. And while some claim he was born in 1846, others say it was 1850. But this minor confusion hasn't kept folks around here from celebrating our founder's birth each and every September. Like the whiskey that bears his name, that's something that won't ever change.

SMOOTH SIPPIN'
TENNESSEE WHISKEY

We're glad you like our whiskey. Please enjoy it responsibly.

Tennessee Whiskey • 40-43% alcohol by volume (80-86 proof) • Distilled and Bottled by Jack Daniel Distillery, Lem Motlow, Proprietor, Route 1, Lynchburg (Pop. 361), Tennessee 37352

Placed in the National Register of Historic Places by the United States Government.

Technology

Coming In Loud And Clear

BY KIM KOMANDO

Quick, fast, rapid, even breakneck: Speed is everything these days, especially when it comes to Web surfing. First there's cable modem service, but it might not be available in your area. Then there are the new 56K and DSL (Digital Subscriber Line) technologies, but you may be too far away from the phone company to take advantage of either. Finally, not many can afford the thousand dollars or more a month it'll cost to run a T1 line into their homes. What's a Web surfer with an urgent need for a high-speed fix to do? How about having Internet content beamed right into your computer through a satellite dish? Sound far-fetched? It's not.

DirecDuo can give you quick access to the Web as well as TV capabilities.

What we're talking about is a product called DirecPC (www.direcpc.com) that lets you access the Internet using the little 21-in. satellite dishes originally developed for television reception. DirecPC can pump data into your personal computer at the incredible rate of 400Kbps. To put that in perspective, it's about 28 times faster than a 14.4Kbps modem, 14 times faster than a 28.8Kbps modem, eight times faster than a 56K modem and four times as fast as the fastest ISDN line. In other words, it's, well, expeditious! You have my word on it.

THE KOMANDO REPORT
COMPUTERS

Dazzling Downloads

After we had a demonstration model installed on a machine at the office (which, by the way, only took about an hour), we jumped onto the Internet through DirecPC and were instantly dazzled with the increase in download speed. Some multimedia-enhanced sites seemed to pop onto the screen faster than I could load a multimedia application from my hard drive, which really is an incredible feat.

Being the cynic in the crowd, I loudly announced: "Keep in mind that most of the sites we're looking at now could have been visited before by this machine. The amazing speed could be the result of a big browser cache instead of a speedy connection."

Then, we began exploring new media-rich sites that I was sure would bring DirecPC to its knees. They didn't. For example, at the AudioNet Jukebox, we were able to download RealPlayer and begin listening to tunes from some of my favorite CDs in just seconds. Most impressive, though, was the fact that once these audio files started streaming into the computer, the sound was crystal clear—no break-ups like the ones you're probably accustomed to if you listen to RealAudio content over a regular phone modem. We hit the official Web site for the movie "Titanic" to view some video clips. Wham! There they were. I buzzed around looking for heavy Shockwave content. Boom! No sweat. Try as I might, I couldn't even get DirecPC to hiccup.

Speed Bumps

As great as DirecPC seems to be, it's clearly not for everyone. First of all, even though DirecPC uses a standard 21-in. dish on your roof and a standard PCI-based expansion card in your computer, the company has developed the necessary software only for Windows 95, Windows 98 and NT 4.0. This means that Windows 3.x, Macintosh, OS/2 and Linux users are *persona non grata* at DirecPC. I think DirecPC is missing the boat here.

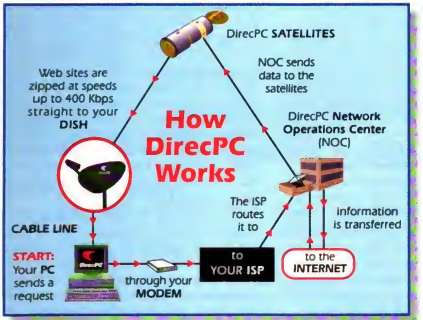
If you just happen to live at the northern foot of a mountain, DirecPC isn't for you, either. To receive all the goodies, your little satellite dish needs a clear line of sight to the south. Another thing to keep in mind: Depending on where you live, your homeowner's association may have something to say about whether you're allowed to stick a dish on your roof.

Another limiting factor to consider is that even with all this cutting-edge telecommunications gear tacked to your roof and jammed into your PC, you still need a regular modem, a telephone line and an Internet service provider (ISP). The reason is that your satellite dish can only receive data—it can't send anything in the other direction. Here's how it works.

You dial into your ISP as usual. When you request a particular Web page from your browser, that request gets routed over the phone line, through your ISP and to DirecPC's server. Instead of sending the requested Web

page back over the phone line, DirecPC reroutes the information through the satellite and down into your dish.

The good news is that this process doesn't have much of an impact on the overall speed of the system. A simple Web address is a tiny amount of information and moves around the Net pretty quickly, even at modem speeds. The



slowdown is traditionally in the downloading of information to your computer, and that's where the 400Kbps satellite link takes over.

The only real drawback here is that you still have to rely on the phone line. If the phone service goes out or your teenager gets caught up in a marathon telephone conversation, you're right back where you would have been with a regular old telephone modem.

Okay, so you're running Windows 95, you live out on the wide open plains, you don't mind using your modem for outbound Net traffic, and you don't have kids. What could possibly keep you from getting connected with DirecPC? Well, the price might break the deal.

Satellite Shutdown

Remember when the Galaxy IV satellite suffered an outage on May 19, 1998, stopping pager services, weather transmissions and more? Approximately half of all DirecPC traffic was carried on that satellite and when it went out of control, service stopped for many of the company's customers, too. DirecPC had service back up within a few weeks and subscribers received credits.

Speed Comes At A Cost

DirecPC offers a pricing scheme that easily can be described as both expensive and confusing. First off, you'll spend about $350 up front just to get things going. Then you'll have to decide on a pricing plan.

At the cheap end of the scale, there's the Executive Surfer plan, which provides you around-the-clock access for a maximum of 25 hours per month. The cost is $29.95 if you use DirecPC as your ISP and $19.95 if you use your own ISP.

Don't get too excited about the savings, though. If you provide your own ISP, you have to pay an extra 95 cents for every hour you use. That means if you use up all 25 hours, you'll spend considerably more using your own ISP. And if you go over the 25-hour limit, you'll get whacked for an extra $1.95 per hour on top of everything else, whether or not you provide your own ISP.

The midrange package is called the Family Surfer plan. At $49.95 ($34.95 with your own ISP), this plan gives you a maximum of 100 hours per month. The other surcharges—95 cents extra for every hour on your own ISP and $1.95 per hour for every hour over the monthly limit—also apply to this plan.

Haven't spent enough yet? Then you should consider the Office Surfer plan. Designed for the small workgroup, this plan provides four e-mail accounts (versus the one provided with the other plans) and allows you to offer DirecPC access to all the users on your local area network. Plus, you get 200 hours monthly before the $1.95 ticker kicks in.

Of course, when you get more, you pay more. The Office Surfer plan costs $129.95 per month, or $109.95 per month with your own ISP. And just like the other plans, providing your own ISP triggers a 95-cent-per-hour ding to your account.

If you really have cash to burn, you may want to consider DirecDuo, a group of service packages that combine satellite television access and Internet access through the same dish. This will set you back about $600 in the beginning, and package prices vary widely.

It's clear that DirecPC isn't for everyone. But if you have the operating system to run it, the right dish location to access it and the bankroll to fund it, DirecPC is one fast Internet ride.

You can find Kim Komando's site on the Internet at http://www.komando.com.

On The Road

BY TOBEY GRUMET

Gigantic, widescreen

movie theaters with plush seats and killer sound systems don't grow on trees. If you're like me—and most people, for that matter—going to a movie involves a modest-size screen, a strong scent of artificial butter and a cramped setting.

Now imagine a beautiful, clean theater with elbowroom and sound that could bring tears to your eyes—oh, and two outsized gold statues with arms crossed standing on either side of the screen. That's what I experienced when I got a chance to view this year's Robert Redford film, "The Horse Whisperer," at the Academy of Arts and Sciences in Los Angeles. If you didn't get the "gold statues" reference, this is the theater where films are screened for coveted Oscars.

ELECTRONICS

Following a trail of black-and-white photographs depicting a young Elizabeth Taylor and somewhat haggard-looking Richard Burton on a chain-smoking binge, we were brought to the theater and seated in red velvet chairs to watch the movie. Because Harman International-owned JBL Pro was behind the scenes as the speaker-system supplier of choice, the company chose this particular movie for us to preview, hoping it would show off the newest Dolby Digital track.

With the pounding hooves of the horses and eclectic musical score, this system sounded better than any movie setup I've heard. And getting to check out the huge speaker array behind the curtain was a serious kick. Although I wasn't allowed to climb up through the hole in the ceiling to scrutinize the entire mammoth system, I could see the speakers and stacked decks of equipment clearly enough. It included five front speakers, three of which were used for the Dolby Digital playback. Of course, with the array of films that are shown in this theater, this system can play just about anything. What makes Dolby Digital so stunning, however, is its use of five channels instead of the four used in Dolby Pro Logic. In order to get Dolby Digital at home, you need a separate decoder and amplifier for the five channels.

Obviously, you won't have speakers of this size or power in your home theater, but it's important to remember that this kind of sound is what the digital audio revolution is all about. And I was glad to have the chance to hear it in a place where entertainment always comes first.

Set-Top Wrapup

As the launch of Digital TV services gets closer, manufacturers are beginning to send out new, somewhat mixed, signals. Of course, you buying a new DTV set is still on their minds, but these days set-top boxes are becoming even more the rage. Top TV makers such as Mitsubishi, Panasonic, Toshiba and Thomson all have committed to making life easier in future TV-land by breaking out separate digital set-top boxes, as well as digital displays. These boxes will receive all digital formats as well as current NTSC signals, but right now they can only go along with digital or digital-ready displays.

Like President Clinton talking up the "bridge to the 21st century," these TV titans are expounding on their ability to bridge the analog and digital worlds of your television. I don't want to hype this theory of "add-on components," so it's important to realize that just a year ago, set-top boxes weren't really a serious option. They were too expensive and most people believed that if you wanted to have digital services, you'd probably spend your money on a new TV rather than a box to sit on top of one.

But things change quicker in this section of the market than a man with his pants on fire, and right now, cable is a serious issue. In fact, the cable industry hasn't yet decided to support the high-definition format, so if you do decide to buy a set-top box from any of these companies, once things are settled you'll have to go out and buy a brand-new one if you want to receive cable. Confusing, I know, but in order to keep up with the technology, these companies have to offer something more than a TV set worth $5000 to $10,000 in their repertoire. It makes sense, but it sure doesn't mean that this is the last word.

None of the set-tops are standardized yet, and once HDTV really comes to the forefront and programming is made more readily available, you can expect more definitive information. As this new revolution becomes more mainstream, it will be interesting to see how things change. For now, we can all sit back and watch the games begin. PM

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Great Stuff

From home improvement to outdoors, automotive to electronics, here's the newest gear you'll want to own.

EDITED BY CLIFF GROMER

Madcap MaviCap

Pictures are now becoming shareware. These days it's easy to take pretty good pictures and send them to friends and family via the Internet. Sony is now incorporating the floppy disk to help save, store and capture some of these digital pictures. Check out the Sony MaviCap floppy disk recorder, offering a new way to grab digital still images from home videos and e-mail them to anyone. It includes video inputs and outputs, as well as a slide show mode for displaying images from the floppy. You'll find two models where Sony products are sold, for $349 and $599. Contact Sony, One Sony Drive, Park Ridge, NJ 07656.

Weight Bearer

Eureka!'s new Atlas backpack may not arrive full, but it's packed with innovative features. Its lightweight ABS frame is horizontally flexible yet vertically stable so it transfers the load to your hips. The fully adjustable sternum strap, hip belt and lumbar straps have a variety of connection points for optimal fit and maximum flexibility. A molded air channel ventilates your back. The front-opening, taco-style bag provides easy access and its Delrin rods allow it to cinch down small loads and expand around large ones. The Atlas sells for $399 at outdoor stores everywhere. Contact Eureka!, 1326 Willow Rd., Sturtevant, WI 53177; 800-572-8822; fax: 414/884-1702.

Delivery Vehicle

The beauty of a right-angle drill-driver is that it will bore a hole or drive a fastener in the most difficult locations, but it can still deliver the goods in standard applications. Take the cord off, add a battery, and you've got a tool that's even more useful. DeWalt's 12-volt drill has high- and low-speed settings. This allows you to choose between applications where low speed and high torque is required at speeds from 0 to 400 rpm, and others where high speed and low torque are needed, with speeds from 0 to 1200 rpm. Its keyless chuck allows you to quickly switch between drilling and driving or different requirements for either job. The tool comes in a carrying case with a battery and a 1-hour charger. It costs about $175 to $185 at home centers and through tool catalogs. Contact DeWalt, P.O. Box 158, 626 Hanover Pike, Hampstead, MD 21074; 800-433-9258.

Good Hood

Make your late-model Dodge, Ford or GM pickup or sport utility vehicle stand out in a sea of lookalike trucks. Good Hood offers ram air styling or a functional ram induction system. The replacement hood bolts onto factory mounting points in about an hour. It is a double-wall lightweight fiberglass composite that is internally reinforced. The ram air hoods sell for $695, while the ram induction models cost $795 at truck accessory outlets. Contact Keystone Restyling Products, 6821 W. Central Ave., Toledo, OH 43617; 800-643-4785.

Easy To Like

If you like the durability and convenience of 2-cycle lawnmowers, then Lawn-Boy's newest mowers should interest you. The 6.5-hp engine uses the typical 32:1 gas/oil ratio but runs 50% cleaner than current models, the company claims, thanks to a new oil and various engine improvements. Lawn-Boy says the engine consumes about the same amount of oil as a 4-cycle engine. Contributing to the cleaner exhaust: a cast-iron cylinder sleeve machined to tight tolerance and a smooth finish, and computer-designed engine exhaust ports.

A rear-wheel-drive GoldPro Series mower with a cast-aluminum 21-in. convertible mulching deck costs about $490 at Lawn-Boy dealers. SilverPro mowers start below $300. Contact the company at 8111 Lyndale Ave. S., Bloomington, MN 55420.

Light As Air

As cameras get smaller and smaller, it's important to remember that quality shouldn't shrink. Contax responds to this with a brand-new single-lens reflex camera called the Aria. Apart from being extremely small and lightweight, it also includes a Vario-Sonnar 28-70 f3.5-4.5 Zoom lens by Carl Zeiss. Quality is maintained by integrating metal components within the light path with engineered plastics in other camera body areas. The SLR shoots three frames per second with the integrated motor drive and weighs only 16.2 ounces. Also included are enhanced flash control, automatic bracketing control (A.B.C.), AE lock, depth of field preview and long eye-point. You'll find the Aria at Contax dealers for $849. Contact Contax, 2301-200 Cottontail Ln., Somerset, NJ 08873; 800-526-0266.

Great Stuff

A Cut Above

With its new Quest, Buck Knives has created a hybrid that combines the performance of a locking blade with the convenience of a pocketknife.

The Quest's slim, rounded thermoplastic handle slides in and out of your pocket easily and fits securely into the palm of your hand. Flick the thumb stud and the 2¾-in. blade locks open. Apply pressure to the midbody and the lock releases. With a partially serrated blade, the Quest is available at outdoor stores for $22. Contact Buck Knives, P.O. Box 1267, El Cajon, CA 92022; 619/449-1100.

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Vying For Vinyl

Although technology keeps getting better, there are always going to be those inventions that never lose their popularity. If you've still got a gaggle of old records but no way to play them, check out the Rotel RP955 belt-drive turntable. It's got two speeds (33⅓ and 45 rpm), a motor synchronized to the AC line frequency, servo control system and a 3-pound die-cast aluminum alloy platter. Look for this product in high-end audio stores for $599.90. Contact Rotel, 54 Concord St., North Reading, MA 01864; 978/664-3820.

Programmed For Success

Intermatic's programmable motorized switch is hard to beat in terms of compact size and versatility. Remove an existing wall switch, install the SS7C in its place, and you can program the function of a wide range of electrical devices, such as lights or heaters. Rated for 15 amps, the SS7C is also capable of timing the function of a device with a 120-volt, 1-hp motor. It is sold with a AA alkaline battery, which provides a source of power so the switch can maintain its program if the power goes out. Suppose you walk into a dark room and you want to manually override the switch to turn on the lights. Press the switch's faceplate to turn the lights on, and press it again to turn the lights off. The switch then reverts to its program. The SS7C costs about $40 at hardware stores and home centers. Contact Intermatic Inc., Intermatic Plaza, Spring Grove, IL 60081.

See The Light

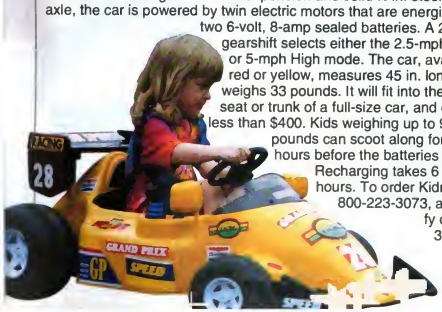
If you or someone in your family is "parking challenged" in your home garage, here's a great alternative to the bumper-bashing school of parking. Park-Zone uses a battery-powered sensing unit that mounts to your garage wall at bumper height. The "traffic light" is mounted to be easily visible to the driver. When your car enters the garage a green light flashes. Midway, the light turns yellow. The red light flashes on when the car reaches its park zone. Park-Zone sells for $99.95 through catalogs and direct from Exeter Technologies Inc., One Penn Plaza, Ste. 4025, New York, NY 10119; 888-393-8371.

It's A Blast

Clearing a stopped drain will never be a pleasant job. The best we can hope for is to make it a little less annoying. Plumber One may help. It's designed to bust clogs using the force of a compressed refrigerant gas known as 134A (rated as a non-ozone-depleting type). Insert Plumber One into the drain opening and push down. The flexible adapter at the can's front creates a seal around the drain opening—the burst of gas is supposed to work in conjunction with the trapped water to create a clog-clearing wave of pressure. The can has sufficient gas for multiple applications. A starter kit costs about $12 and includes two drain adapters and an extension handle for use in toilets. It's sold at home centers and Sears hardware stores. Contact Enviro-Care Distributors, 2393 Teller Rd., Ste. 107, Newbury Park, CA 91320.

Kiddyap!

Mario Andretti has nothing on your kid. Your child, age 2 to 6, can get a jump on the competition for a future Formula One championship by cutting his teeth on the Kidracer—a tough, quarter-scale molded plastic race car. Featuring steel front suspension and solid ¾-in. steel rear axle, the car is powered by twin electric motors that are energized by two 6-volt, 8-amp sealed batteries. A 2-speed gearshift selects either the 2.5-mph Low, or 5-mph High mode. The car, available in red or yellow, measures 45 in. long and weighs 33 pounds. It will fit into the back seat or trunk of a full-size car, and costs less than $400. Kids weighing up to 90 pounds can scoot along for 2 to 3 hours before the batteries give out. Recharging takes 6 to 10 hours. To order Kidracer, call 800-223-3073, and specify order No. 302606.



How do you keep your mattress on your bed during a wild ride?

Great Stuff

No Tanks

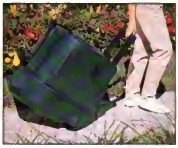
Surface-supplied air systems like Brownie's Third Lung are becoming increasingly popular with divers, and diving families in particular. That's because they're compact, manageable and safe.

Instead of wearing heavy tanks on your back, you get air through a tube connected to a surface air supply. While it limits the depth of your dives somewhat, it also keeps divers in contact with the surface and each other.

There are several models, but the Model 330 can accommodate three divers at 30 ft. or two divers at 60 ft., and breaks down into two suitcase-size bags. It's available through authorized dealers for anywhere from $2600 to $3050. Contact Brownie's Third Lung, 940 N.W. First St., Ft. Lauderdale, FL 33311; 800-327-0412.

Draw Your Own Conclusion

If you've concluded that your portable hose reel is an unreliable and annoying device, then consider this product. It's a vertical hose reel on which you can wind 250 ft. of ⅝-in. vinyl hose. The reel is mounted vertically, with the folding hand crank at the top. Its vertical configuration and 40-in. height reduces the distance you have to bend forward to wind up the hose. Also, the device has a hose-winding mechanism that travels vertically and adjusts automatically to kinks in the hose. It costs about $70 at hardware stores and home centers. Contact Union Tools Inc., c/o Marketing Dept., 500 Dublin Ave., Columbus, OH 43216; 800-888-4196.



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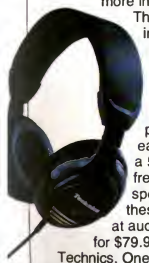
The Original Compact Disc

In 1958, backyard barbecues and beach-blanket bashes were accented by a groovy new invention: the Frisbee. This year, America's favorite flying disc, one of the first items to employ a little-known substance called "plastic," turns 40. To celebrate, Wham-O is introducing the Frisbee Maxflight, a long-distance flyer with a soft edge that makes it easy to catch. The Maxflight costs $13 at sporting goods and toy stores, where you can also find the original for about $1.99. Contact Wham-O, 3830 Del Amo Blvd., Ste. 101, Torrance, CA 90503; 310/370-9100; fax: 310/370-9124.

Hear No Evil

Sometimes you just have to put on headphones. Although listening to your music freestyle is always more comfortable, there are times when privacy is key. For these occasions, Technics introduces a kickin' pair of headphones, designed for use with digital products for more intense sound.



The RP-F800 includes an XBS (Extra Bass System) port for stronger bass response, polyurethane earpads, and a 5Hz to 32KHz frequency response. You'll find these headphones at audio retailers for $79.95. Contact Technics, One Panasonic Way, Secaucus, NJ 07094.

Clean Cut

With a 12-amp, 3-hp motor, this edger should be able to cut a nice, clean edge through the toughest sod. Its depth of cut is adjustable, without tools, down to 1¼ in., and you can produce either vertical or 30° bevel cuts with it. When the blade is dull, remove and reverse it for a fresh edge. The edger costs about $100 at Sears and Sears hardware stores. Contact Sears, Dept. 703, 333 Beverly Rd., BC 112B-A, Hoffman Estates, IL 60179.

It Beats Popcorn

The wonders of GPS (global positioning satellite) systems have become so commonplace that prices of even high-end units are dropping into the reach of most outdoorsmen. Take the Magellan Blazer 12. For $120 or less, you get a 12-parallel channel receiver with enough memory to record 100 locations and one reversible route with up to 10 legs. With two AA batteries it'll run for 20 hours, and it weighs only 7 ounces. It's got Magellan's EZstart initialization, backlighting and tough, waterproof construction. You can find it at outdoor stores, or contact Magellan, 960 Overland Ct., San Dimas, CA 91773; 909/394-5000; fax: 909/394-7050. PM

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TITANIC

Two intrepid groups of dreamers attempt to recreate the world's most famous ship.

BY JIM WILSON, Illustrations by Tom Freeman

It is truly a titanic endeavor.

Tempting the fates, two newly formed shipping companies hope to revive the golden age of the transatlantic passenger liner by building full-scale replicas of the *Titanic*. The keel of the first ship could be laid as early as this month, in Durban, South Africa. If the work steams ahead on schedule, the replica's owner, RMS Titanic Shipping Holdings of Durban, could welcome passengers aboard for a Dec. 29, 1999, maiden voyage. About two years later, a second replica proposed by White Star Line Limited of Basel, Switzerland—a new company unrelated to the original White Star Line—could begin her maiden voyage.

COVER STORY

Both transatlantic crossings will be largely ceremonial. After retracing—and hopefully completing—the *Titanic*'s interrupted journey from Southampton, England, to New York City, they will head for southern waters to begin careers as vacation cruise liners.

A Titanic Obstacle

Creating floating steel palaces worthy of their namesake isn't as simple as placing an order with Harland and Wolff, the *Titanic*'s builders. The biggest problem is the *Titanic* herself. After the 46,000-ton ship slid beneath the sea on April 15, 1912, killing 1523, seafaring nations tightened passenger ship construction and safety regulations. "There is no way you could rebuild the original *Titanic*," Capt. Christopher McMahon of the U.S. Merchant Marine Academy in Kings Point, N.Y., tells POPULAR MECHANICS. "They [the replicas] may look like the *Titanic*, but they won't be the *Titanic*."

Even the *Titanic*'s sister ship, the *Britannic*—under

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Popular Mechanics
SEPTEMBER 1998

RETURNS

construction at the time of the disaster—couldn't be built to the original plans. And its older sister, the *Olympic*, was put into dry dock for a major overhaul that included massive structural changes.

Even if some sort of special exemption could be granted to allow construction of a down-to-the-rivet replica, it is questionable how many passengers would be willing to pay $30,612 to $382,650 to spend four to five days tossing about the Atlantic on a ship with turn-of-the-century plumbing. And let's not forget superstition. The *Britannic*, which served as a World War I hospital ship, sank after it hit a mine, and suffered similar damage to the *Titanic*. Thirty of the 100 on board died.

Sarel Gous, managing director of the South African project, acknowledged that there will be differences. "Our *Titanic* will look identical to the original, but of course with the latest s[illegible]ety technology," he says.

Steel Dreams

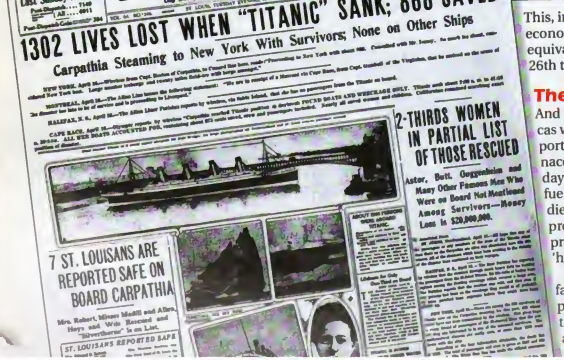
The two would-be replica builders were still negotiating with naval architects and shipyards when PM went to press. So, we asked Neil Gallagher of Webb Institute in Glen Cove, N.Y., the country's foremost school for naval architects, how closely the replicas were likely to mimic the original. It depends how close you look, he said, because the great ship's most distinctive features will have to be faked. Not that fakery is new to the *Titanic* name.

In her era, the *Titanic*'s most distinctive features were her four proudly raked funnels. Actually, only the three nearest the bow were real. A fourth, dummy funnel was added to make her look, well, titanic. Both replicas will have four funnels. However, all will be ornamental because the modern ships won't have steam engines. "I doubt you would find anyone who would build a reciprocating steam engine," said Gallagher. The same holds

Inside The New Titanic

true for the *Titanic*'s boldly riveted hull. Once again it isn't simply a matter of finding skilled labor. Today's ship hulls are welded.

The shape of the hull will also need to change. "The hull design of the *Titanic* was pretty good for its day," said Gallagher. He quickly added that the same design could spell economic ruin in today's highly competitive cruise-ship industry. The biggest change will occur just below the waterline, where the ships could be fitted with a bulbous protrusion that prevents the formation of an energy-robbing bow wave, explained Gallagher.



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7 ST. LOUISANS ARE REPORTED SAFE ON BOARD CARPATHIA

Mrs. Robert Wilson Mudd and Allen Hays and Wife Rescued and "Survivor-Owner" is on List.

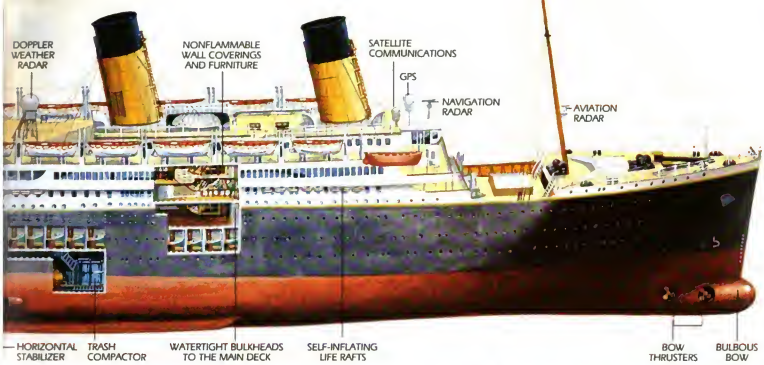
ST. LOUISANS REPORTED SAFE

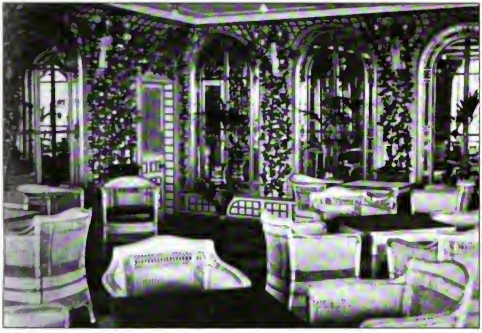
This, in turn, will improve fuel economy by about 4%. That is the equivalent of a free fill-up for every 26th transatlantic crossing.

The Hotel Load

And fill up is exactly what the replicas will do when they arrive in port. While the *Titanic*'s 159 furnaces burned 825 tons of coal a day, the replicas will sip diesel fuel. "They will probably use diesel generators so they can provide electricity for both propulsion and what we call a 'hotel load'," said Gallagher.

Modern cruise ships are, in fact, floating hotels. To keep passengers happy as they tour tropical climates will require, among other things, air condi-





The* Titanic *was not only the largest ship of its day but also the most elegant. Replicas of its furniture, like the ship itself, will have to be updated, chiefly by using woods, upholstery and carpeting that meet today's safety standards. The builders of the South African replica say that for added authenticity, the furnishings for its ship will be made in England.

tioning, more than double the three passenger elevators on the *Titanic*, and enough current to power all the hair dryers that will be turned on a half-hour before each dinner seating.

"The beauty of multiple diesel generators is that you can redirect the power from propulsion to the hotel load as needed," said Gallagher. In the space occupied by about five of the *Titanic*'s 29 boilers, the replica's five diesel generators will crank out enough power for the ship's electric motors and today's electrical essentials.

Scrapping 29 boilers and 159 furnaces will free up lots of space, but pose another design problem. Weighing less than the original, the replicas will ride higher in the water. This, said Gallagher, will make them

less stable. "They would probably need a permanent or sea water ballast," he said.

Ship owners will also have to worry more about what comes out of the cabins. In the *Titanic*'s day garbage and waste, sanitary and bilge water were simply thrown overboard. McMahon says that to meet U.S. Coast Guard regulations the replicas will need modern sewage treatment plants and garbage compactors to store solid waste until it can be trucked away at port.

Capt. Tom Pineault of the American Bureau of Shipping, an organization that certifies the structural and mechanical fitness of ships, says that although the replica projects face substantial challenges, the problems are all solvable, for a price. Project backers have placed the cost of their ships between $400 million and $600 million, about twice as much per passenger as modern cruise liners, estimates McMahon. Annette D. Völcker, of the White Star Line, believes the expense will be worth it. "We are giving back to sea travel what it has lost in modern times—an air of magnificent elegance." PM

SAFE

WONDER WEAPON

Buck Rogers, your new rifle is ready.

BY SANDRA I. ERWIN, Photos by Spencer Jones

The OICW will be the most versatile weapon ever built. It can kill targets hidden around corners or dug in half a mile away.

American soldiers going into battle in the next century may carry a weapon so advanced it will make today's assault rifle seem as primitive as the muskets fired at Bunker Hill.

Understand that there is absolutely nothing wrong with the venerable M16 rifle, its fraternal twin the M4 carbine or their trusty sidekick the M203 grenade launcher. It is the enemy who has changed. Military analysts say that in the future there will be fewer Desert Storms and more low-intensity operations, including missions to capture drug kingpins and to rein in regional warlords. Confronting these enemies will draw Army and Marine infantrymen into unwelcome new battlefields. Tomorrow's wars will be fought in the unmapped streets and alleys of the Third World's sprawling slums.

For several years, arms makers have been competing to design the rifle future soldiers would use. It had to be a weapon capable of winning on urban battlegrounds as well as in more familiar desert, forest and jungle terrain. The Pentagon dubbed its dream rifle the "objective individual combat weapon," or OICW.

DEFENSE

The winning entry—submitted by an international team of companies led by Alliant Techsystems of Hopkins, Minn.—looks more like a prop from a Buck Rogers movie than anything you've seen at a rifle range. The modular, 2-barrel weapon promises to turn foot soldiers into devastating, precision-firing platforms.

The OICW can be a dual- or single-barrel weapon. The removable top barrel hurls 20mm high-explosive air-bursting fragmentation rounds over the heads of hidden targets more than a half-mile away. The lower barrel shoots NATO-standard 5.56mm ammunition. These "kinetic" rounds provide accurate single-round or suppressive fire bursts at distances up to about 500 yards. A single trigger is linked to both barrels, by way of a laser-guided electronic fire-shot system as sophisticated as what you will find on a modern tank.

"OICW will leave no place for the enemy to hide on tomorrow's battlefield," says Don L. Sticinski, vice president of Alliant. Having won the $8.5 million competition, the company will now build seven OICWs and about 4700 rounds of test-fire ammunition. These will be used in an advanced technology demonstration program managed by the Joint Service Small Arms Program Office, at the Army's R&D center in Picatinny Arsenal, N.J.

Urban Warrior

Commanding General Joseph W. Arbuckle has invited POPULAR MECHANICS to have a look as the first operational OICW undergoes tests at Picatinny. Program manager Matthew T. Zimmerman, an OICW enthusiast, introduces

The Perfect Infantry Weapon

Like current-generation infantry weapons, OICW will break down into modules for fast in-field parts swapping.

us to the infantryman's new best friend: "Preliminary testing programs conducted at Picatinny during the past several years have proven OICW is very effective and has awesome destructive power."

Zimmerman says that the key to the OICW's success in urban warfare is its electronic fire-control system, which enables the rifle to determine when its "smart" 20mm ammunition should detonate. Like conventional explosive rounds, these shells will detonate on impact, says Zimmerman. However, they also can be set to explode after passing through a wall or sheetmetal. This capability could be especially useful in Third World shantytowns, where abandoned or pirated cargo containers are popular building materials.

Firing Around Corners

The most impressive and useful feature of these munitions is their airburst capability. "The fuzing technology is key to our system," says Alliant program manager Michael C. Moore. He explains that a laser rangefinder pinpoints the precise distance at which the fragmenting round needs to detonate, killing the enemy even if he is hiding behind trees or walls, or in trenches.

The Army Infantry Center in Fort Benning, Ga., charged with evaluating new technologies and tactics, agrees. The OICW can take out the types of targets that in the past required an M16 equipped with an M203 grenade launcher. The difference is that the OICW can do the job with pinpoint accuracy. This is a critical advantage when enemies hide among civilians—a prime survival tactic in urban warfare. And the OICW's range of 1000 meters is five times greater than what an M16 equipped with an M203 can achieve.

The OICW will shoot 20mm rounds one at a time and 5.56mm rounds in single shots or 2-round bursts. For direct fire, OICW has a video camera and a video-tracker function. A special-purpose computer puts electronic brackets around a moving target and automatically determines its range. It doesn't do all the work, though. "You have to be able to hit the enemy with a laser beam in order to know where it is," says Alliant's Moore. "You can't get range information if you can't laze on the guy or near the guy. That's a given. There's no magic in it." It isn't as easy as it looks. The diameter of the laser beam is intentionally narrow to keep the rangefinding computer from being thrown off by background clutter.

As in consumer electronics, less is more when it comes to weight. One drawback of the current weapon system is that add-ons bring the weight of an M16 to just under 20 pounds. Production model OICWs will be about 6 pounds lighter. In the field, light weight alone brings a performance advantage.

All things considered, Army officials who have evaluated the OICW believe it will provide nearly five times the firepower an infantryman currently carries into the field.

Converting Skeptics

Despite the promised advantages and the Infantry Center's enthusiasm, the OICW has a way to go toward convincing some skeptics.

"I don't think OICW is going to change the way we conduct warfare," says Charles Q. Cutshaw, an independent infantry weapons consultant based in Spotsylvania, Va. "It's not going to make a difference in close-quarters battle [less than 75 ft.], because high-explosive ammo is not typically used," he says.

Alliant's Moore points out that using high-explosive fragmentation

"Test units firing M16s suffered 70 casualties. The force firing OICWs saw only one soldier go down."

rounds at short ranges is something the users decide on. "We can give them something that's usable at 20 meters or we can make the fuze so it doesn't arm till 70 meters, or whatever the safe separation distance is determined to be. That's a user decision. The weapon is not technology-limited."

Most experts inside and outside of the military agree that the OICW is more evolutionary than revolutionary in concept. "It integrates several existing electronic and computer capabilities into what is essentially a rifle and grenade launcher," says Terry J. Gander, infantry weapons editor for Jane's Information Group in England. "The electronics provide the high-explosive round with accuracy and fuzing capabilities that would have been impossible 10 years ago."

Combat Electronics

There are, however, some concerns about the durability of the electronics. Gander's concern is not so much the functionality of the computer as maintenance and support issues. "What happens when you drop it or when it gets wet?" he asks. Gander suspects maintenance costs could make the OICW more of a financial burden than anyone suspects.

The weapon's makers agree that these are legitimate concerns, but hardly project killers. Life cycle costs are issues that arise with many of the systems the Marine Corps and the Army already employ. "These concerns are not unique to OICW," says Alliant's Moore.

OICW was tested in the full range of temperature extremes it's likely to encounter in combat.

Sticker Shock

For observers encountering OICW for the first time, there is also the question of sticker shock. If the demonstration project is successful over the next several years, the Pentagon plans to make an initial purchase of 45,000 OICWs, to be in the hands of elite light-infantry units by 2006. The weapons will cost between $10,000 and $12,000 each, plus $25 to $30 for each 20mm air-burst round.

Critics point out that this is more than 20 times the price of a bare-bones M16 assault rifle. But raw numbers can be deceptive. While the basic M16 costs about $500, the must-have options for urban warfare quickly drive up the price. An M16 equipped with an M203 grenade launcher and thermal weapon sight currently costs about $29,000. The complete M16 modular weapon system, with a digital laser, compass, thermal weapon sight and laser pointer, costs $35,000. "We are comfortable with the cost," says Zimmerman. "The money is worth it."

Technical specs and accounting ledgers don't tell the whole story. In simulated combat, an OICW prototype showed the weapon's true potential. When the simulated hits were tallied, the virtual units firing M16s suffered 70 casualties. Those firing the OICWs saw only one soldier go down. In real combat, there's only one figure that counts: The number of good guys left standing after the fog of battle clears. PM

Simulations enabled the Army to compare OICW kill-power with the currently fielded M16's.

BY TOBFY GRUMET, *Photo By Skip Gandy*

Whether you're embarking on a Caribbean adventure or just trying to capture junior's first dive without a belly-flop, nothing's better than a camera you can take underwater. And believe it or not, you don't need to be a professional to use—or afford—an underwater camera.

Scuba diving and snorkeling are two great reasons to experiment with one of these products. If you've ever gone below to try these pastimes, you know how breathtaking the underwater views can be. Once you've decided to strap on some dive equipment and head down below, we're sure you'll appreciate the nifty, low-priced photography gear we've rounded up.

PHOTOGRAPHY

We used three different cameras and examined a fourth, ranging in price from approximately $180 to $1500. Most cameras will come as a kit, with different lenses, carrying cases, framers (which show the area being photographed) and other equipment. It is possible to buy something waterproof for under $100, but it won't come with any extras and the picture quality will be inferior. To test the equipment, PM took the plunge and shot some awesome pictures in the depths off St. Croix and Florida.

CAPTURE THE RAPTURE

Underwater photography can be fun and accessible for almost everyone.

"You can buy a waterproof camera for under $100, but its picture quality will be inferior."

The Basics

There are a few ways to get started with underwater photography. You can get a full kit, which is what we decided to do with three of our four test cameras—or you can simply purchase a waterproof housing for a camera you already have. Most housings are made for higher-quality cameras such as upper-end Nikons or Canons and can run anywhere from $2000 to $10,000.

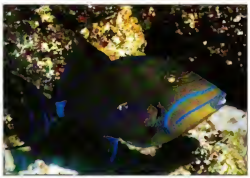
But if you're like us, you might want to get a single system that includes everything you need. If you're going diving, rather than snorkeling, you should think about getting a separate lighting system as well. Rather than a flash, underwater cameras use a strobe. This is a bulb at the end of an arm made from machined aluminum or a molded composite material. Divers can choose between single- and double-strobe systems. Prices start at about $200 and go to more than $1000.

And if you're keen on getting some good moving footage, there are also housings made for video cameras, ranging in price from about $300 to $10,000.

Going Under

The Ikelite Aquashot 3 was the lowest-priced camera system we examined. Several packages are available, ranging from $180 to $250. For $250, you'll get a see-through housing that shields a Fuji Endeavor-10 disposable camera. It also includes a small strobe, removable framer, diffuser to soften the light from the camera's flash, a macro lens (for framing something that's about 6 to 8 in. away), a water correction lens, travel bag, film and batteries. Unfortunately, Ikelite sent only the housing and camera, and then told us not to dive with them because the unit wasn't production-quality. So we can't report on the Ikelite's performance.

The SeaLife ReefMaster is a nifty little product. It comes in an easy-to-tote bright yellow plastic case and has a low-key price tag of $199 for the camera, viewfinder, case and lanyard. We also got the new Macro 3x closeup lens, which runs for an additional $39. The camera has a removable housing and a built-in strobe.



This is the sturdiest of the under-$500 camera systems we saw, and it lets you take pictures above water. The strobe always stays on automatic, and if you need to take a picture out of the water without a flash, you simply push a small lever.

The ReefMaster is an easy camera to use. Simply point and shoot. However, it doesn't provide as broad a view as the more expensive cameras, and because the strobe is motor-driven, you don't have much control of your light.

We suggest you spend the extra $40 for the closeup lens, because it can help with photos within 2 to 4 ft. underwater, and 10 in. on land.

The lens also includes an underwater filter that helps combat the problem of underwater lighting. When you dive, the water filters light, exhausting the colors of the spectrum, in order of shade. Red and yellow go first, eventually leaving an overabundance of blue. This filter coat will reflect any colors up to green on the spectrum, while rejecting some of the overwhelming blue light. This gives pictures a richer color overall, rather than that cold bluish tint. It also avoids glare and reflections by reducing the brightness of the flash for close distances.

The next level of performance comes with the Sea & Sea Motor Marine 35 MX10. This camera distinguishes itself from its low-budget brethren with a built-in camera. In other words, there's no separate housing to play with when loading or unloading film. However, when you are unloading, you must switch a special lever to automatically rewind the film before you open the casing.

The MX10 is a great midrange option. It comes with a bag of accessories and has a wider angle capability than the previously mentioned cameras. For $671.95, you'll get the housing/camera, a 32mm focus-free lens that expands to about 45mm underwater, viewfinder, detachable YS-40 strobe, macro lens and underwater filter.

One interesting aspect of this camera is its infrared signaling system, which synchronizes the attached auto-strobe without any cords or connectors. This makes things easy for both beginners and professionals.

We liked this camera for its powerful strobe and intense macro and closeup capabilities. As we noted before, sometimes the bag of goodies that comes with a camera can make a huge difference in your underwater experience.

SEA & SEA MOTOR MARINE 35 MX10

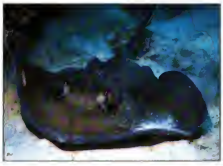
NIKONOS V

IKELITE AQUASHOT 3

SEALIFE REEFMASTER

It's also good to know that if you haven't set the MX10's f-stop for enough light, there will be a steady red glow from a tiny light bulb. Hey, just in case.

Leader Of The Pack



The last camera of the pack is the Nikonos V. Although this isn't a new product, we believe it's still one of the best. Released back in 1984, this camera still takes high-quality pictures, and it costs less than $3000.

The camera itself is waterproof and can be purchased for $800. It has a large viewfinder that gives plenty of eye relief and even includes a high-visibility LED exposure display. And we really appreciated the fact that the viewfinder is optical, rather than frame, which means you can look through the lens instead of the framing square for a clear optical picture underwater. Translated simply, the view is much more natural. Through-the-lens (TTL) flash control is also included and controlled by a silicon photo diode (SPD) that responds to the light coming through the lens for a brighter, more accurate picture. The camera is light and really easy to shoot—with no extra housing. It creates fabulous-looking prints.

But in order to really get the pictures you want, you'll have to invest in a few pricey accessories. We got our hands on a 15mm lens, a really amazing attachment—but one that will set you back about $2190. If you're serious about getting good underwater photos for less than $5000 (but more than $500), this system is for you. And it's also a great step-up purchase once you've gotten the hang of things underwater.

As for you really big spenders, Nikon introduced a sister camera system to the Nikonos V in 1992. The Nikonos RS Underwater Single Lens Reflex System offers even higher quality than the Nikonos V—but a full system can run you close to $10,000. With that kind of price tag, the RS won't find many customers beyond the ranks of professional photographers.

So if you're planning on becoming the next generation's Jacques Cousteau, you might want to start out with one of these more amateur-oriented cameras. Remember, in many cases less is more! PM

PORSCHE BOXSTER

LONG-TERM TEST CARS

Our fleet performs flawlessly despite El Niño.

Despite some climatic vagaries, all of our long-term testers fared well over the past several months.

QUARTERLY UPDATE

Porsche Boxster

Dick Dale and the Del-Tones. Chinese food and Sunday night. A Porsche Boxster and the Pacific Coast Highway. Some things just belong together.

Our blue Boxster is now back in New York, fighting suicidal cabbies, car-swallowing potholes and hair-curling levels of humidity. But from Christmas weekend until May 1, it lived with me in Southern California. And we bonded. This is a fun car.

It was a wet winter in L.A., so the Porsche's top was up much of the time, and, thankfully, it stayed watertight even in the worst weather El Niño had to offer. Top-down days were definitely more fun, but the Boxster proved entertaining any time.

Test Summary: Porsche Boxster
Report number: 2
Total miles driven: 21,546
Miles driven since last report: 20,231
Average fuel economy: 22.4 mpg
Worst observed fuel economy: 14.1 mpg
Best observed fuel economy: 32.6 mpg
Maintenance/repair costs: One quart of synthetic oil, $6.55; Body repair, $100.00; 4-wheel alignment, $255.00; Replacement tow hook plug, $12.99; Scheduled 7500-mile service, $175.27; Scheduled 15,000-mile service, $338.33; Replacement Pirelli P-Zero tires, $1500

Except, of course, when the car was with the courteous and competent guys at Steve Taub Porsche in Santa Monica for service, which was often. These visits were rarely cheap. The long list of repairs and scheduled servicing the car has received doesn't even include all the warranty work done to the car, which extended to replacing the visors because both vanity mirror doors broke, replacing the mudflaps in front of the rear wheels because of pitting and discoloration, and attaching a new Boxster emblem to the rear decklid because part of the "B" went bye-bye.

In the car's defense, some of the repairs listed weren't its fault, like the repairs to one of the doors

averaged between 20 and 27 mpg—not bad for a sports car.

But, what's most impressive about the Boxster is how tough it is. Drive this thing like you stole it, and it just asks for more. In fact, the harder you drive it, the better it feels. Even pure abuse, the kind of stuff that would break most cars, like First-gear power slides on the rev limiter, don't seem to bother this Porsche. And overworking these brakes is tougher than watching the Rosie O'Donnell Show.

—Scott Oldham

Toyota Camry XLE

For those of you who like traveling incognito, there's the Camry. When you drive an example of the best-selling car in the country, you should expect to be lost in a sea of similar cars. Let me tell you, there have been times that our Camry has cruised down the pike surrounded not just by a half-dozen or so other Camrys, but a half-dozen or so identical-looking ones. Last year Toyota sold over 397,000 of these sedans, more than any other carmaker sold of any car. That kind of ubiquity has both its benefits and its detriments. For one thing, if you're looking to hide in traffic, this car's perfect. However, if you're the kind of person who loses his car in a big parking lot, you can spend hours trying to find your Camry when it's time to gather up the family and leave the mall.

And our Camry has made plenty of trips to the mall. And to the home center. And to the garden center. And to the in-laws. And to that forbidding island called Manhattan. Like so many other Camrys, ours tackles each task without fuss and without complaint. It does anything asked with absolutely no flair or fanfare, yet with surprising aplomb.

It's this car's willing adaptability that continues to amaze and impress. The Camry is as happy and adept creeping through rush-hour traffic with a full trunk and full passenger cabin as it is blasting down an on-ramp past some glamorous sports sedan. Despite the Camry's plebeian exterior, its V6 pulls when you ask it to—enough to smoke the front tires if you shut off the traction control—and the independent suspension flattens and straightens the road on command.

TOYOTA CAMRY XLE

Test Summary: Toyota Camry XLE
Report number: 3
Total miles driven: 26,710
Miles driven since last report: 4222
Average fuel economy: 22.2 mpg
Worst observed fuel economy: 20.4 mpg
Best observed fuel economy: 24.6 mpg
Maintenance/repair costs: Replacement wiper inserts, $14.00

necessitated by someone else's bad parking manners. Plus, we overpaid for the Pirelli P-Zero tires, which needed replacing at, we thought, a premature 13,000 miles. Our dealer charged us $1500, which included about $100 for mounting and balancing, but a wholesale mail-order place will sell you just the tires for under a grand.

Fuel mileage has been interesting. Run the car hard around town, and an abysmal 14 mpg is not that unusual, which drains the tank after only 166 miles. Out on the highway, however, we've logged an impressive 32.6 mpg and milked over 325 miles out of a tankful. We

Yes, we're beginning to hear a minor clunk from somewhere in the rear and the driver's seat is rocking again in its mounts. But otherwise, this thing remains a motorized anvil, with a hedonistic soul beneath its choirboy veneer. *—Don Chaikin*

CHEVROLET MALIBU LS

PHOTO BY GREG AREM

Test Summary: Chevrolet Malibu LS
Report number: 3
Total miles driven: 11,923
Miles driven since last report: 2477
Average fuel economy: 24.0 mpg
Worst observed fuel economy: 21.7 mpg
Best observed fuel economy: 25.5 mpg
Maintenance/repair costs: Scheduled 10,000-mile service, $40.67

Chevrolet Malibu LS

Just about every week a new car shows up in my driveway. I return one, get another. Mostly they tend to be sporty or performance vehicles. You might see a BMW, Navigator or Corvette parked there. Even the Volkswagen's new Beetle made an appearance recently.

Still, believe it or not, one of the most comfortable test vehicles to drive is this Malibu LS. I find myself scheming it into first position in the driveway lineup. What I like most is the engine/transmission response, nimble handling, the smaller sedan size and more-than-adequate room inside. I agree with those who rate Malibu as a car well above average in everyday practicality.

Not to say our Malibu LS is without its flaws. Those niggling little defects continue to appear. Since the last report I've had a number of problems repaired, including that foggy right headlamp (replaced), broken shoulder harness button ("There's a bulletin out on that. I'll have to back-order it to match the color"), and rattle in the instrument panel cover (had to reset an air conditioner duct underneath).

What I forgot to mention to the dealer was the air draft in the door handle that occurs when a window is opened. I did remember to point out that the mysterious squeak in the front suspension had again disappeared, but that the suspension felt loose when turning on rough pavement. Both items were checked by a mechanic's short road test and okayed without any adjustment made. At the same time, the Chevy dealer switched tires and did an oil-and-filter change. These were the only expenses, for a total of $40.67.

Some cold-weather problems seem inherent in the Malibu door design. With the right humidity during cold weather—say, around 18° F—the doors stick, frozen to their frames. Pull extra hard on those flipper handles and you might get them to open. Windows, too, are difficult to open during freezing weather. The electric motors can't budge them before the heater warms up. —*Jim Dunne*

that it's an SE with leather interior, power driver's seat, a sunroof, ABS, an automatic transmission and a 4-cylinder engine. She thought for a moment, looked over at her year-old Toyota Camry and responded "$15,000." That's a coincidence, we thought. After driving the Altima 22,000 miles, which included two cross-country hauls, we too think it should cost $15,000. The problem is that our test car stickers for $22,506, more than the last V6 Honda Accord we tested and much more than our Chevy Malibu LS. Nissan will tell you that sticker price and transaction price are more different than Barry White and Betty White, so it's completely possible to get an Altima equipped like ours for under twenty large. This seems more reasonable, but it makes our $19,000 Malibu look that much better.

Anyway, the Altima has proven reliable, and the two Nissan dealers we've used have proven that getting a car serviced doesn't have to be a nightmare. Santa Monica Nissan and Nissan of Temecula, both located in Southern California, took good care of us and our car. The 15,000-mile service was inexpensive, and an alarm system glitch was fixed the first time under warranty.

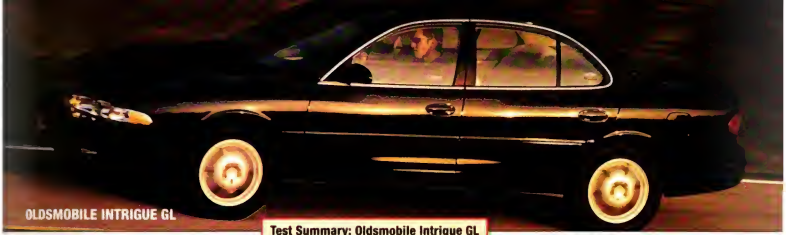
NISSAN ALTIMA SE

PHOTO BY LIS BERGMAN

Test Summary: Nissan Altima SE
Report number: 3
Total miles driven: 21,862
Miles driven since last report: 7524
Average fuel economy: 26.6 mpg
Worst observed fuel economy: 21.6 mpg
Best observed fuel economy: 30.6 mpg
Maintenance/repair costs: Scheduled 15,000-mile service, $82.54

Nissan Altima SE

It happened again the other day. A co-worker asked how we liked the Altima. We said we liked it, but then we asked her what she thought our test car should cost, pointing out



OLDSMOBILE INTRIGUE GL

Driving the Altima hasn't pegged any fun meters—even though our car is an SE with the sports suspension—but it eats up highway miles like a sedan should, its fuel mileage is improving as it breaks in, and comfort on long drives is above average. One editor did complain of too much lumbar in the seat, while another thinks the radio is set too low in the dash for eyes-on-the-road operation, and we all think the 150-hp 2.4-liter engine is too buzzy and a bit weak. Overall, however, as an A-to-B sedan, the Altima works. —*S.O.*

Oldsmobile Intrigue GL

Now that we've driven the Olds Intrigue almost 10,000 miles, we still think it's one of the great performance bargains of the year. This is a car we love to commute in. Its taut suspension calibration and extremely responsive steering make it the ideal vehicle in which to carve up traffic in the big city and blow them all off once you get out on the highway. On- and off-ramps are a special treat as you simply drive around Bimmers costing thousands more.

That said, here are the negatives: First, the front seats have way too much built-in lumbar. For the first week, we thought someone on the assembly line had inadvertently left a fist in the lower seatback. And there's no adjustment in our test car. Guess our spines have gotten used to it by now—it doesn't bother us anymore. Second, the gas tank is too small. This car is fast and begs to be driven hard. Which we do. Often. Trouble is, fuel mileage averages only about 18 to 19 mpg when the car is used that way. With our commute, we have to gas up every third day. It's an annoyance.

Hey, the CHANGE OIL light is still on. It went on at 5512 miles. We'll be getting to that soon. —*Joe Oldham*

Test Summary: Oldsmobile Intrigue GL
Report number: 2
Total miles driven: 8897
Miles driven since last report: 8640
Average fuel economy: 20.4 mpg
Worst observed fuel economy: 18.4 mpg
Best observed fuel economy: 24.2 mpg
Maintenance/repair costs: None

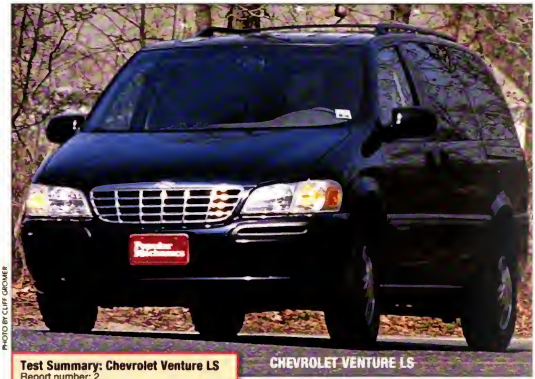


PHOTO BY CLIFF GROMER

CHEVROLET VENTURE LS

Test Summary: Chevrolet Venture LS
Report number: 2
Total miles driven: 9816
Miles driven since last report: 9735
Average fuel economy: 19.7 mpg
Worst observed fuel economy: 9.3 mpg
Best observed fuel economy: 23.1 mpg
Maintenance/repair costs: One quart of oil, $1.25

Chevrolet Venture LS

Our Venture has been used for a couple of weekend-long hero drives into the Midwest, once to ferry furniture and once to rescue two antique motorcycles. In addition, it's seen service as a daily commuter in Manhattan and New Jersey traffic. We've appreciated the excellent handling, the good mileage and the powerful engine. And we'll never own a minivan without a sliding left-side door again. One failing is the lack of power operation of the driver's-side sliding door—or maybe it's just that we're so in love with the power-operated passenger's sliding door. The only way we could think of improving that is if it were telepathically operated, because you still have to fish in your pocket for the remote key fob, something that's tough to do when you're standing next to the van with both hands full of grocery bags.

Most of the time, the seat just inside that door resides in the garage, which makes for easy entry into the rear row of seats, something that otherwise is difficult for most adults, even with the seat folded up and away. Removing the seats is a snap, and so is installing them—once you crack the code. The seats vary slightly depending on their position because of the seatbelt anchors, so they have to be reinstalled in their assigned positions. Learn from our experience: Mark them with tags, because you can kill an hour figuring it out.

The Venture has consumed 1 quart of oil so far, and is due for service at the dealer. Otherwise, everything has worked faultlessly. —*Mike Allen* PM

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WHEN YOUR COMPUTER GETS SICK

Computer viruses are everywhere. Here's how to keep your computer from "catching a cold," and what to do if it does.

BY KIM KOMANDO
Illustration by Paul Blumstein

What strikes fear into the hearts of computer users more than a hard-drive meltdown? Try the words "computer virus." From small annoyances such as unwanted screen messages to the unbearable threat of a total system crash, these unsavory viruses easily can bring a host of costly problems.

COMPUTERS

Recently, new computer viruses have been appearing daily, and with Internet usage increasing exponentially they are spreading like an oil spill. In fact, because online usage has jumped dramatically in the past few years, it's now estimated to be about 20 times more likely for the average user's computer to contract a virus. Likewise, experts claim that as many as 500 new viruses are introduced into cyberspace each month. Scary stuff.

There's no question that every computer user should have some sort of virus scanning software—programs that can help prevent your computer from contracting a virus and wipe one out if it should sneak in.

Moving Past Swapping Floppies

Contracting a virus can be simple. It's all a matter of introducing an infected file onto your computer system. And today, more types of files can be infected than ever before.

Originally, a computer could only contract a virus by running infected executable computer code. In the early days of online computing, the sadistic hackers who originated viruses would often disguise their creations as legitimate shareware programs and post them in cyberspace for the whole world to consume. Back then, it was widely held that you couldn't contract a computer virus simply by opening a regular file. Then along came Microsoft Word and Excel.

As an intended enhancement to these two products, Microsoft added the ability to embed macros—little automated routines—directly into Word and Excel documents. A macro is nothing more than a miniature application program. On the upside, some macros make it easy to exchange a Word file or Excel file with someone else and have the document function identically on the other person's computer.

To make things more complicated, it wasn't long before the high-tech vandals figured out how to create macro viruses. Now you really could contract a computer virus by just opening a document, wreaking havoc on other Word and Excel files.

Another urban myth busted: Despite rumors, you can't contract a virus by simply opening an e-mail message (though you're still vulnerable when you open an attachment to an e-mail message). Internet warnings that viruses can be contracted by reading e-mail have been circulating for some time now and have given rise to a category of mischief known as the hoax virus—a dire warning about something that doesn't really exist. One of our favorite archives of high-tech urban legends is located on the Internet at www.kumite.com/myths.

So what's the good word? Many companies offer the tools you need to protect yourself and your computer—and most cost only $40 to $50.

"You can't install a virus scanner and expect it to protect you forever—you need to update the database regularly."

What's The Difference?

All the major players in the virus protection arena do a fine job of eliminating computer viruses. The main differences lie in their various interface features and update/upgrade options.

While user interface tends to come down to personal preference, differences in update/upgrade options can determine the value of a given package.

What's the difference between an update and an upgrade? Virtually all virus scanners use some sort of virus definition database to check your files against known computer viruses. As new viruses are released, the virus database on your computer can become outdated quickly. You can't simply install a virus scanner and expect it to protect you forever—you need to update the database regularly. Before you choose a package, be sure to consider where you get the update and how much it costs.

By contrast, the term "upgrade" refers to modifications and enhancements to the actual application software. If a whole new class of virus is invented, you may need a product upgrade to deal with it.

PHOTO BY PIQUTELE/GAMMA COLOUR LIBRARY

McAfee VirusScan

McAfee is a widely recognized name in virus protection.

Because McAfee merged with three other companies, McAfee VirusScan is now a product of Network Associates Inc. The company offers a single package that includes VirusScan for Windows 95, Windows NT, Windows 3.1x, DOS and OS/2, as well as a separate package for the Macintosh operating system. The [illegible] Package includes the DOS and [illegible]ows versions on diskette, just in case you don't have a CD-ROM drive.

McAfee has done an excellent job of providing users with interfaces that feel right for each system. On the Windows 95 version, for example, the VirusScan interface has the general look and feel of Windows Explorer. The Mac version uses a completely different interface that makes Macintosh users feel at home. All versions provide you with complete control over when and which files are scanned for viruses.

VirusScan offers tremendous value in terms of product updates and upgrades.

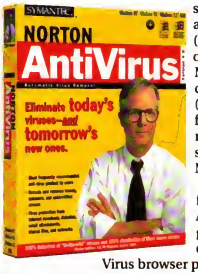
Unlike some other vendors, McAfee offers virus definition updates free to registered users for the life of the product. These updates are available online from the Network Associates Web site, on CompuServe (GO MCAFEE), on America Online (keyword MCAFEE), and even from a direct-dial BBS system (408/988-4004). Furthermore, McAfee offers free product upgrades to newer software versions for a full year after you purchase VirusScan.

Product upgrades are especially easy for Windows 95 users. Through a service called SecureCast, you can click a button in VirusScan and have the program automatically updated over the Internet. If you find even that to be too much work, you can configure SecureCast to use "push" technology to update your software over the Internet periodically without any additional prompting.

If you are using Windows 98 and get the Windows 98 Plus! Package, aside from some additional desktop themes and games, you'll find McAfee's VirusScan on the Plus! CD. But you get only six months of free updates.

Two From Symantec

Symantec produces two different virus scanners. Norton AntiVirus ships with Windows and DOS versions (but no OS/2 version) on a single CD. For Macintosh users, the company offers SAM (Symantec AntiVirus for Macintosh), the most popular virus scanner for the Macintosh platform.



One interesting feature of Norton AntiVirus is that it gives you the option of installing an AntiVirus browser plug-in if you're using Netscape Navigator or another browser that's compatible with Netscape plug-ins. This plug-in automatically scans files as they are downloaded via your Web browser, providing an added measure of security as you surf the Web.

Like the McAfee product, Norton AntiVirus provides one-click access to online virus definition updates, through a feature called LiveUpdate. Although Symantec has long offered these updates for free during the life of the product, the company recently announced that it is converting to a fee-based subscription for updates.

Under the revised policy, users will receive free updates for one year, and then be required to pay $3.95 per year for further updates. The reason, according to Symantec, is that increased virus activity is prompting the company to begin publishing updates on a weekly rather than monthly basis. The subscription fee is designed to offset Symantec's extra costs.

Although SAM does not include a browser plug-in, it still offers added Internet protection through a feature called SafeZones. Using this feature, you identify SafeZones folders on your Macintosh, where you plan to download files from the Internet. Each time a new file is added to any folder designated as a SafeZone, SAM automatically scans that file for viruses.

SAM also offers single-click access to virus definition updates. However, instead of using the Internet, SAM uses your modem to dial directly into Symantec for the up-

dates. Updates via the Internet are available, but you need to visit the Symantec Web site and download the new definition files manually.

Quarterdeck's Extra Strength ViruSweep

Quarterdeck, a company well known in the PC utilities arena, checks in with Extra Strength ViruSweep, a Windows 95-only package. At about $70, this is the most expensive package reviewed here. (A "regular-strength" package in the $40 range is also available.)

If you spend a lot of time on the Internet, you may find the features in Extra Strength ViruSweep worth the extra dollars. This is the only package reviewed here that claims full protection against what Quarterdeck calls vandals, which include malicious Java applets and ActiveX controls downloaded over the Internet.

This added measure of Internet security is provided through a technology that Quarterdeck calls eSafe Protect. As various Java applets, ActiveX controls and other Web-page programs are downloaded into your computer, eSafe Protect puts them under Total Sandbox Quarantine. The eSafe Protect software then analyzes each element and

places it in its own Sandbox—an area on your hard drive where the element is "approved" to operate.

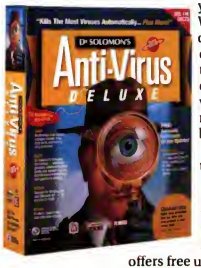
Extra Strength ViruSweep continues to monitor each element and alerts you to any activity that the element attempts outside of its own Sandbox. You then are asked to approve or disallow this activity.

Using the eSafe Protect technology, you also can set up communications filters, which allow you to establish individual controls for the various communications ports on your computer, and create lists of banned IP addresses from which you wouldn't download data.

Extra Strength ViruSweep offers free updates from the company's Web site.

Dr. Solomon's Duo

Dr. Solomon's Software, recently acquired by Data-Fellows, offers a pair of virus scanners: Dr. Solomon's Anti-Virus Deluxe for Windows 95/NT and Dr. Solomon's Virex for the Macintosh OS. Both products offer a number of valuable features.



Dr. Solomon's Anti-Virus Deluxe claims to offer the best technology for scanning compressed files. The program can actually scan for viruses inside multilayered archives in zip, lzh, arj, arc, and a variety of other compression formats. The program also boasts superior protection against what it calls polymorphic viruses—those that look a bit different in each infected file and are therefore more difficult to match to a virus definition database.

Similar to its Windows brother, Dr. Solomon's Virex can scan compressed files using all the major Mac compression schemes (Stuffit, Disk Doubler, Compactor Pro, etc.), as well as zip files. Plus, you can have the program scan all files downloaded from the Internet, so you don't have to set up special folders, as you do with Symantec's SAM. Finally, Dr. Solomon's Virex is OS 8-compatible: The program will even add a Scan with Virex option to OS 8's contextual menus.

Both programs weigh in at the higher end pricewise—about $60 for Dr. Solomon's Anti-Virus Deluxe and about $70 for Dr. Solomon's Virex. Both include free automatic updates.

Important Web Sites

http://www.nai.com
http://www.symantec.com
http://www.quarterdeck.com
http://www.drsolomon.com
http://www.checkit.com

The Rest

There are a number of other virus protection packages on the market. Among the more popular are Dr. Solomon's Anti-Virus (the non-deluxe version) and PC-cillin, from TouchStone Software. Quarterdeck also includes a limited virus scanner in its Extra Strength RealHelp suite of diagnostic utilities.

Before you invest in any anti-virus software, we strongly suggest you check the vendor's Web site for information on virus definition updates. First, make sure that the updates are current. If the latest viruses aren't included, no virus scanner can be of full use.

Perhaps just as important, find out if you'll be charged for updates. Fee structures can vary widely from vendor to vendor. For example, although Dr. Solomon's offers free updates for its deluxe package, the company charges an annual subscription fee of $29.95 for virus definition updates to its less expensive standard package.

An Ounce Of Prevention

Remember, virus protection software should never be your first line of defense against infection. Just because you've installed the latest, greatest virus definitions, don't think you can download from any online source, no matter how suspect it seems.

The best advice is to download files from established Internet sites. You can also download with relative confidence from major corporate sites. Although it's very important to have virus protection software on your computer, if you're careful in your online and offline endeavors, it shouldn't have to do much work. PM

PHOTO BY FPG/TELEGRAPH COLOUR LIBRARY

HANG 'EM HIGH

Flat-panel speakers bring new dimensions to sound.

BY REBECCA DAY

This magician wasn't David Copperfield, merely a man in a lab coat. And his magic was no illusion. Without any sleight of hand, he produced a 9 × 12-in. panel made of a superthin composite also used to make airplanes, deftly attached a wire to the back, and turned it into singer Tracy Chapman. Okay, so Tracy Chapman wasn't really there, just a loudspeaker like nothing we'd ever seen before. But it still seemed like alchemy to us.

If U.K.-based New Transducers Limited (NXT) has its way, we'll be hearing a lot more than Chapman's earthy voice coming from flat-panel speakers in the next few years. Born of a British Defence Research Agency project aimed at finding ways to isolate noise in airplane cockpits, NXT speaker design is the latest venture of British electronics company Verity Group, whose respected loudspeaker brands include Mission, Wharfedale and Quad. Verity Group is licensing the flat-panel technology under the name NXT to companies that include NEC and JBL parent Harman International.

AUDIO

Forget The Norm

To understand how the NXT flat speakers work, it's best to temporarily forget what you know about how your living room speakers operate. The model of an amplifier connected to a loudspeaker doesn't change with NXT technology, but the similarities end once the electrical signal hits the voice coil. No woofer, no tweeter, no crossover. Just a tiny magnet, a voice coil and a panel that could be made of aluminum or paper.

In a conventional speaker, the signal from the amplifier energizes a magnetized voice coil that's connected to a diaphragm. The diaphragm vibrates, causing the surrounding air to vibrate in response to the audio signal and to recreate the original audio wave form in as linear a form as possible.

NXT speakers operate in a world of "psychoacoustics" and, well, utter chaos. The magnet-and-coil assembly moves a microscopic 40 microns, barely nudging the rigid panel to begin a series of bending waves that travel in all directions.

"You end up with these bending waves that are now crossing at every angle and at different speeds," says Jon Vizor, director of marketing for NXT. "And it becomes this chaotic mass of crossing bending waves that form the modes that produce the music."

Although NXT operates in a different sphere, its goal is that of conventional speaker design: to simply reproduce the audio signal as faithfully as possible.

"At one extreme, you're trying to design a transducer that's as nonresonant as possible," says Dr. Floyd Toole, vice president of engineering at Harman International, licensor of NXT technology in the United States. "At the

NXT LOUDSPEAKER

NXT loudspeakers come in all shapes and sizes. One thing they have in common is their flatness.

Flat speakers can make home theater look and fit a lot better in your home.

other extreme, you have a system that in its ideal form is nothing but resonance. And there are so many resonances and they're so densely packed together in the frequency domain that no one of them stands out as being discretely audible as a source of unwanted coloration. What you hear is a facsimile of what you should be hearing."

Because the radiation of sound waves from an NXT panel is so diffuse, the speakers don't create a sweet spot—that perfect listening position between the speakers where imaging and sound stage are defined in the conventional speaker world. For that reason, flat-panel speakers will probably never make it in audiophile circles. But there are plenty of applications where the diffuse soundfield makes sense, both in and outside of the home. Since there's no beaming of sound from a single point source, you can easily walk around a room where flat-panel speakers are playing and not hear a variation in volume or timbre. That could play well in multiroom audio and home theater systems, and the possibilities in large public spaces are endless. Imagine a ceiling-tile speaker that could cover a much broader area and deliver much better intelligibility than a conventional speaker.

GEKKO SPEAKER PANELS

Flat Is Flat

NXT can make panels as slim as 0.3mm deep using plastic, glass fiber, carbon fiber, aluminum or any number of stiff, lightweight substrates. The company boasts working samples of full-range speakers that cover eight octaves but weigh less than 2 ounces. NXT offers no claims for reproducing frequencies below 200Hz in a reasonable-size loudspeaker and expects flat speakers designed for the home to be supplemented by beefy subwoofers. The first NXT-licensed product for the U.S. market—which includes subwoofers from sister company Mission Electronics—was expected to reach stores by mid-August. The $799 system comprises a pair of 12 × 11 × 1-in. flat panels that mount on the wall and a traditional pistonlike 10-in. powered subwoofer to handle the bass.

"Our technology is scalable from credit-card size to 120-sq.-meter cinema screens," Vizor says. "And it has the same acoustic benefits and properties no matter what the size. The difference is bass performance. You need very large screens to get very low bass."

The multimedia speaker is a prime target for both NXT and Harman. In fact, the first commercial application of NXT technology was in the NEC model PC-9821 laptop PC that sells in Japan. The 0.5mm flat-panel speakers slip behind the PC's screen when they're not in use,

"NXT boasts working samples of speakers that cover eight octaves but weigh less than 2 ounces."

and deliver a sound that beats most laptop speakers. Desktop PCs and personal digital assistants (PDAs) are also prime candidates for the technology, as are talking posters and banners, public address systems (because of the diffuse sound pattern there's no feedback) and car audio speaker systems.

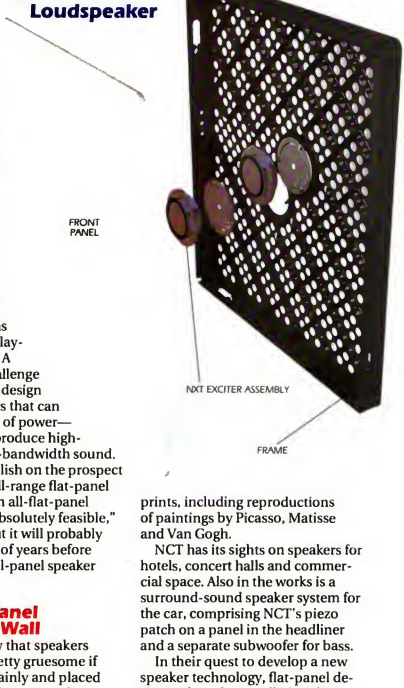
While NXT sets its sights on future applications for flat-panel speakers, several companies that have various patent swaps and cross-licensing agreements with NXT—including Sound Advance Systems, Fostex and Noise Cancellation Technologies Inc. (NCT)—are delivering their own versions of flat speakers in the United States.

According to Dave Claybaugh, vice president of NCT Audio Products Inc., his company and NXT are both trying to create the same result but are going about it differently. NCT uses a cool-running piezoelectric driver, rather than a magnet and voice coil, to induce vibrations in its panel. Also, NCT is shooting for a minimum flat-panel stand-alone low-end response of 100Hz, rather than the 200Hz NXT has promoted, Claybaugh says. In order to achieve that level and to come to market first, NCT cobbled together a hybrid design using a flat panel and a traditional cone driver to handle the midbass frequencies. Its Gekko system also includes a separate 10-in., 65-watt subwoofer.

"We ran into a lot of the same challenges that NXT has run into," Claybaugh says. A primary challenge has been to design small drivers that can handle a lot of power—enough to produce high-quality, full-bandwidth sound. But he's bullish on the prospect of a true, full-range flat-panel speaker. "An all-flat-panel speaker is absolutely feasible," he says. "But it will probably be a couple of years before we see an all-panel speaker alone."

The NXT Exciter Assembly will make any material sing, though getting very low bass is definitely a problem.

Inside The NXT Loudspeaker



Panel, Panel On The Wall

We all know that speakers can look pretty gruesome if they're ungainly and placed incorrectly in a room. So, obviously, these speakers are bringing new ideas to home decoration—as well as speaker technology. The question is: After you get a speaker off the floor, what do you do with it on the wall? NXT sees a mirror speaker as one alternative, while NCT turns its speaker into art.

NCT's 11 × 14 × 2.5-in. Gekko speakers ($299 each) come in black or white, but the interesting twist is the replaceable grille ($79), which bears a print that's stamped onto acoustically transparent silk. The company's catalog boasts 450 art prints, including reproductions of paintings by Picasso, Matisse and Van Gogh.

NCT has its sights on speakers for hotels, concert halls and commercial space. Also in the works is a surround-sound speaker system for the car, comprising NCT's piezo patch on a panel in the headliner and a separate subwoofer for bass.

In their quest to develop a new speaker technology, flat-panel designers have been called tricksters who are trying to reinvent the laws of physics, claims Vizor. NXT argues that its design principles have been used for decades in submarine design and bridge building, not just in loudspeaker design. Harman's Toole observes that using one or two transducers to excite a panel has posed a number of considerable problems in physics and engineering that NXT has had to solve. "This is not a hoax," Toole says. "It's a genuine engineering exercise, and to the extent that it works as well as it does, it's been successful." FM

Science

JACK DANIEL'S OLD NO. 7

Tennessee's favorite whiskey has been made the same way for 130 years. We'll drink to that.

BY MARK ALPERT

Somewhere deep beneath the hills of southern Tennessee, a cold, clear spring rises through the darkness and trickles out the mouth of a cave. In 1866, an industrious 20-year-old picked a spot near that cave to set up a whiskey still. Using a local distilling method called the Lincoln County process, he produced a whiskey smooth and strong enough to take the edge off the bitter memories of a brutal civil war.

More than 130 years later, Jack Daniel is a Tennessee legend and his Tennessee whiskey is a symbol of a reunified America's industrial success. It's the libation of choice for everyone from rock stars to rock climbers and corporate executives to couch potatoes. And it's gaining enormous popularity overseas, where it is seen as the quintessential American drink. But while the world may have changed around it, Jack Daniel's has remained the same—it's still made according to its original 19th-century formula, and every drop of the stuff still originates from that cave in Lynchburg, Tenn.

The history is important because, to this day, the Jack Daniel distillery is a crossroads of technology and tradition. The building itself is a maze of coils, pipes and enormous vats filled with gases and bubbling fluids. The air is hot and steamy, and a rich grainy aroma pervades the space.

The look and feel of the distillery has been compared to a ship's boiler room, and if that's the case, then the chief engineer is master distiller Jimmy Bedford. A handsome Lynchburg native who has worked for Jack Daniel's for nearly 30 years, Bedford oversees the distillery's 350 employees as they combine the art and science of whiskey making: Technology monitors quality, but traditions have the final say. "There's no big dark secret to making Jack Daniel's," Bedford says. "We just do it very well."

AMERICAN CLASSICS

A statue of "Mr. Jack" stands guard to ensure that the distillation process doesn't change.

In fact, the secret is crystal clear: It's the iron-free spring water that flows at a virtually constant temperature of 56°F (iron can add unwanted flavors to whiskey). When mixed with the other raw ingredients of Jack Daniel's—corn, rye and barley malt, which are delivered to the distillery in huge truckloads every day—this natural water is the basis of a great whiskey. But not just any mix will do.

Giant milling machines grind the corn to a consistency that's a little coarser than the cornmeal used to make bread. Then it's mixed with the spring water to make a cornmeal mash, which is heated to a boil in a 10,000-gal. cooker. The rye is added to give flavor to the mash, and the barley malt provides an enzyme that breaks down the starch into soluble sugars. Next, 2300 gal. of spent stillage—mash that's already been put through the distillation process—is added. This step is what makes Jack Daniel's a "sour mash" whiskey. Despite the implication, sour mash doesn't add a sour flavor. Instead, it ensures a consistent taste from one batch to the next.

Likewise, Jack Daniel's cultivates its own particular

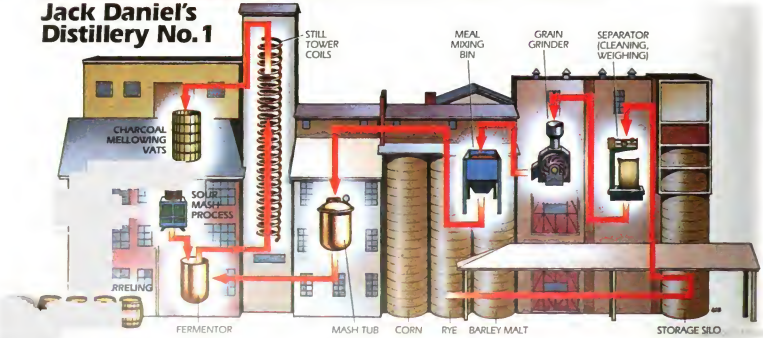
strain of yeast at the distillery. These marvelous one-celled creatures do the work of fermentation, consuming the sugars in the mash and excreting carbon dioxide and alcohol. Because different strains of yeast impart different flavors to whiskey, the folks at Jack Daniel's go to great lengths to make sure their yeast never changes. At a small laboratory in the distillery, workers grow the yeast, then transfer it to large cultivating tanks. In these tanks the cells multiply furiously for 18 hours in preparation for the fermentation process.

Every 2½ hours nearly 40,000 gal. of yeast and mash are pumped into one of the distillery's 48 fermenting vats, which are stainless steel tubs as big as swimming pools. At this point, the mash is like a watery porridge, yellow-orange in color and as sweet as creamed corn. After 4 hours or so, the mash begins to roil with bubbles of carbon dioxide, and it continues to ferment for four to six days. When the mash finally settles down, it's almost 10% alcohol. The stuff is now called "distiller's beer," although it's nothing like the beer that comes in a six-pack. A rotating arm at the bottom of the vat stirs up the mash, and then it's pumped to one of Jack Daniel's four stills.

Each still is a 45-ft.-high copper column, rising like a ship's smokestack through the floors of the distillery. The distiller's beer is pumped into the column near its top, while steam is pumped in at the bottom. The steam heats the beer as it pours down the column, causing the alcohol in the mixture to vaporize. The vapor is run through a doubler—a second distilling process—and then liquefied in a water-cooled condenser. What comes out is crystal-clear 140-proof whiskey.

If this liquid were put directly into barrels and aged, it would become a bourbon. But Jack Daniel's isn't a bourbon. It's a Tennessee whiskey. The difference is an extra step called charcoal-mellowing. The distillery makes its own charcoal by sawing sugar maple logs into slats and burning them in the open air. The charcoal is ground up and packed into mellowing vats, and then the 140-proof whiskey is dripped into the vats and allowed to seep through the charcoal. No one at Jack Daniel's really knows how the mellowing works—Jimmy Bedford believes the charcoal removes unpleasant oils from the alcohol—but the effect is unmistakable. The whiskey that comes out of the vats is much smoother.

Jack Daniel's Distillery No. 1



"Glasses of whiskey are kept in a special room. Workers are encouraged to drop by and taste the samples."

The distillery has a quality-control lab where technicians test samples from each batch of Jack Daniel's. A gas chromatograph measures the presence of various oils and carbonates, but the best instrument for quality control is still the taste bud. Glasses of clear whiskey, fresh from the mellowing vats, are kept in a special room near the lab. Jack Daniel's employees are encouraged to drop by and taste the samples (but not to swallow them—tasters have to spit out the whiskey). But the real test is when designated tasters check for consistency by comparing the new samples with whiskey made the year before. They must give the thumbs up before the whiskey can be aged.

Once approved, the whiskey is cut to 118 proof and poured into charred oak barrels. The barrels are stored in massive barrelhouses—7-story buildings sitting on the hills around the distillery—and the whiskey is aged for four to six years. As the seasons come and go, temperature changes draw the whiskey into and out of the charred wood of the barrel. That's what gives Jack Daniel's its dark mahogany color. When the whiskey is judged to be mature—through careful sampling and tasting—it's taken from the barrelhouse, run through a strainer and cut again, to 86 proof. Then it's bottled in the distinctive square bottles that Jack Daniel's has been using for more than a century.

Clockwise from opposite left: Distillery No. 1 dissected (bottom) and the view from outside. Burning hard sugar maple to make the charcoal. In the fermenting vats, yeast converts sugar to alcohol. Master distiller Jimmy Bedford. The whiskey ages in large oak barrels for four to six years.

No one is quite sure why "Mr. Jack" called this blend Old No. 7, but it certainly has been lucky. Jack Daniel's is so well-known that the distillery has become a tourist destination that attracts more than a quarter of a million visitors every year. Despite this popularity, you won't see any of the tourists drinking around the grounds. You see, Lynchburg, Tenn., the town where Jack Daniel chose to produce his legendary Tennessee whiskey, sits in a dry county.

HOME FOR A LEGEND

Old 16 is now fittingly enshrined at the Henry Ford Museum.

BY JIM DUNNE

Few machines are more exciting, conjure more romanticism or tickle more notions of nostalgia than race cars. And the most stirring emotions are probably those provoked by the old legends from the earliest days of motoring competition. That is the very reason that the Henry Ford Museum, in Dearborn, Mich., has installed Old 16 as a prime attraction.

For those of you who do not remember, Old 16 was the first American car to win an international race. It's more than appropriate, maybe even mandatory, that such a critical piece of our automotive heritage finally should be enshrined in this world-famous museum. Here, where decades worth of famous—and infamous—cars mutely mingle with Ford Trimotor aircraft and some of the world's largest steam locomotives, Old 16 takes its proper place among the legends of Americana.

RESTORATION

Yet, despite the car's fame, its record is brief. She ran two international races: lost one, won one.

But what a win.

In 1908, against the best and fastest the world had to offer, Old 16 claimed the Vanderbilt Cup by winning a 258.5-mile road race. The Vanderbilt win established the American car as a major force in international high-speed, long-distance competition. Her 60-plus-mph average speed over the Long Island, N.Y., course was a furious pace compared with the 10- to 15-mph limit of production cars on the road at that time. Eleven laps divided the course, each 23.5 miles long. Old 16's average speed in the race was just over 64 miles per hour, and its top was over 100 mph. By the time it reached the finish line, Old 16 had bested 17 competitors, including cars from Italy, France and Germany. Her lead over the second-place car was decisive: 1 minute 48 seconds.

A crowd of upwards of 200,000 turned out to watch the race, some camping all night to be sure not to miss the event.

Two people rode Old 16 to victory, 23-year-old driver George Robertson and mechanic Glenn Etheridge. While Robertson negotiated the winding sand roads of Long Island's East End, Etheridge labored over an air pump to keep pressure in the fuel tank. He also fiddled with four other pumps to maintain oil pressure in the

With its restorers aboard, Old 16 goes for a shakedown run before being enshrined at the Henry Ford Museum.

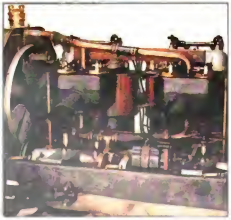
engine. Competitors rode in open cockpits, protected from the elements and road dirt by elaborate costumes: full-length rubber suits over the body, fabric masks for the face and goggles for the eyes. Aviator-type helmets with chin straps had bulging ear muffs that opened at the back. They cut wind noise from the front and allowed driver and mechanic to communicate via the open backsides.

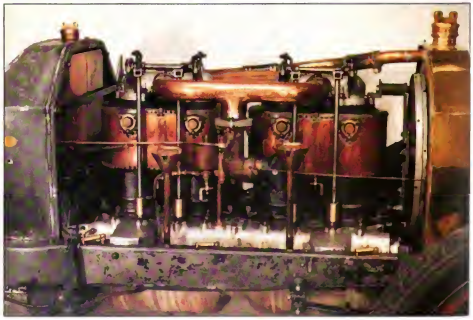
While the heart of Old 16 was its enormous 16-liter, 4-cylinder, 90- to 110-horsepower engine, a key to the Vanderbilt victory was a quick-change tire routine. In those days, flat tires were to be expected, and the demands of the Vanderbilt made tire changing a certainty. Old 16's loss in the 1906 Vanderbilt had been blamed on poor tire-change methods—the old "pry the tire off, jimmy the new tire on, inflate the new tire" routine. In 1908, however, the car used a new European system—Michelin's "Quick Change" rim—which cut

"Of 17 starting positions, this car drew No. 16, and its name."

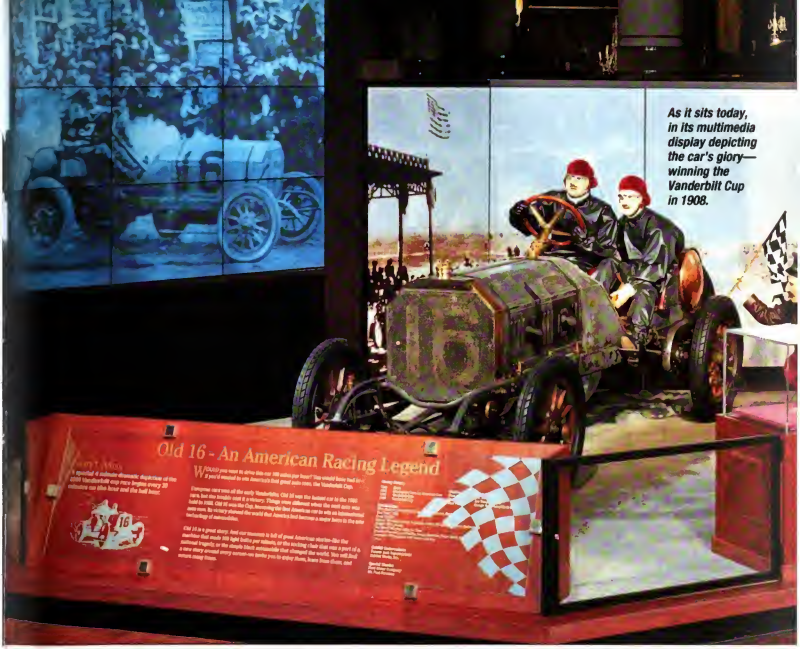
time dramatically and helped win the race for the Americans when a tire went flat on the last lap.

Old 16's drivetrain was simple, and a reflection of the time. The bulk of the engine consisted of four cast-iron cylinders and copper water jackets. By today's standards that purpose-built Four was huge. Start-ups called on arm power, a vibrating magneto and a small storage battery. Once started, the ignition ran on





Crowds of early race fans lined the roads of eastern Long Island in 1908 to watch the Vanderbilt Cup race. The cars ran against the clock, but lack of wheel-to-wheel competition didn't slow the cars. Old 16 gets airborne over a crest (top). The cars tore through villages at speeds faster than 60 mph, with no barriers between fans and cars (above, center). The American-made Locomobile No. 16 thrilled the fans by winning. Its huge 4-cylinder engine boasted copper water jackets to cool the cast-iron cylinders.



As it sits today, in its multimedia display depicting the car's glory—winning the Vanderbilt Cup in 1908.

magneto alone. A Zenith updraft carburetor funneled the air/fuel charge. Old 16 carried no mufflers—just simple dump pipes that jutted out the sides of its combustion chambers (another argument for those ear-covering helmets). The gearbox had three forward gears, and a leather-cone clutch shifted power to a central differential. Shafts from there led to chain sprockets and then on to the rear wheels. Other than the Michelin rims, wheels were typical of the time, with 12 wooden spokes front and rear in 16-in. rims.

While the occupants sat up high, the vehicle is not outsized by today's standards. Wheelbase, at 110 in., is not far from that of a modern mid-size sedan. Length is a mere 163 in., comparable to today's subcompacts. Curb weight is listed at just over 2200 pounds, a real lightweight thanks to the before-its-time aluminum body and metal substitutions made in engine materials, where, among other changes, copper water jackets replaced the more-typical iron castings.

Old 16 was built by the Locomobile Car Company of Bridgeport, Conn. It cost $20,000 to make—an enormous sum of money for the time and, in fact, three times the retail price of Locomobile passenger cars that year.

Okay, you may ask, since it's a Locomobile, why has it been known as Old 16 for nearly a century? The answer is very simple and traces back to that famous race. The Vanderbilt's entrants received starting places by lottery. Out of 17 possible places in the race, Locomobile picked number 16. In those days, starting position wasn't a place on the grid, as it is in today's road races. As in a modern rally, each of the racers was started separately and timed individually. Later, "Old" was added to the 16 as a term of endearment.

See Old 16 at the Henry Ford Museum in the heart of Ford country, Dearborn, Mich. A special exhibit displays the car in its original form—complete with mannequin driver, mechanic and checkered flag-waver. (For you styling aficionados, be sure to take a longer look at the shape of the car itself. It's been called the Mona Lisa of Racing Cars). For more info, before you actually travel visit the Henry Ford Museum on the Internet: www.hfmgv.org.

LOADED AND LOCKED

Recent tragedies reinforce the need to store firearms safely. New technology helps.

BY RON SPOMER

Speed Release

This is a clamshell-style lock for the new millennium. Even in the dark, the lighted keypad is easy to see and opens quickly. In tests, the 9-volt battery has lasted for 1500 cycles or 5 years.

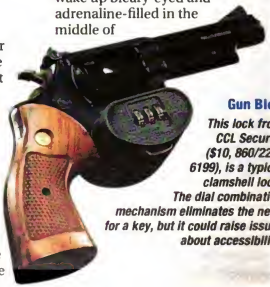
Today, 44 million Americans keep 65 million handguns in their homes. Unlike sporting guns or collector's pieces, most handguns are purchased for personal protection. And perhaps for good reason. Research by criminologist Gary Kleck of Florida State University indicates that Americans use firearms to successfully defend themselves 2.5 million times each year, often without firing a shot.

But this self-reliance comes at a price. In 1995, 181 children died as a result of firearms accidents, and according to the National Safe Kids Campaign, another 1500 kids ages 14 or younger are treated in emergency rooms for accidental firearms injuries each year. These facts, combined with recent schoolyard shootings, make it clear that gun owners must do more to secure their firearms against theft and illicit use. Gun locks are one answer.

FIREARMS

In 1997, federal legislators introduced a bill that would have made it mandatory for all new handguns to come with a lock. But before the bill ever came up for a vote, most American gun manufacturers volunteered to provide locks with their new products by the end of 1999. This was a definite step in the right direction, but it still leaves a lot of new and used guns without locks.

Of equal concern to gun owners is the effect locks have on their sense of security. Today's locks are mechanical devices that require keys, combinations, or levers and buttons—things that are hard to remember or to operate when you wake up bleary-eyed and adrenaline-filled in the middle of



Gun Blok

This lock from CCL Security ($10, 860/229-6199), is a typical clamshell lock. The dial combination mechanism eliminates the need for a key, but it could raise issues about accessibility.

the night. There are ways around these shortcomings—unlock the gun before going to sleep, complete all but the last number of the combination, etc.—but for many, gun locks seem like imperfect compromises at best.

The most common locks are clamshells, so named because they have two metal or polymer pieces that clamp around the trigger guard like a shell and completely cover the trigger. A good one is the Master Gun Lock ($13, 414/444-2800). It's easy to use and allows several guns to be locked with the same key.

However, some people worry about the key falling into the wrong hands. For them, there are clamshell combination locks. These have no keys to fuss with, but they require a good memory under pressure and good eyesight in the dark.

The Speed Release Gun Lock ($35-$45, 800-939-2311) takes the combination clamshell into the digital age. It has a lighted touchpad that's easy to see in the dark and faster to operate than a dial. Six incorrect combinations in a row shut the unit down for 15 minutes. With a 9-volt battery, the Speed Release is good for 1500 cycles or five years, though the manufacturer recommends 800 cycles or one year just to be safe.

One of the few options that matches a clamshell in terms of price and simplicity is a barrel block, which secures a metal rod down the barrel. A key locks the rod into a dummy cartridge, preventing live rounds from being chambered. A gun so locked cannot fire even if dropped, and the obvious locking device deters theft. When the locking rod is removed and the dummy round ejected, a live round will load.

Trigger blocks are a third option. They can be either external or internal. The Saf-T-Blok ($20, 800-472-4405) from Concept Development is a good example of an external trigger block. It's a simple anodized aluminum block that fits between the rear of the trigger and the trigger guard. Pushing the block free with your index finger makes the gun usable in an instant. A 3-dial combination padlock ($7) can be mounted through the unit for permanent locking.

Saf-T-Blok

The external trigger block was designed to prevent a gun from firing accidentally while being carried. With a padlock it becomes an effective gun-security device as well.

Internal trigger blocks arrest the firing mechanism inside the gun, usually with a blocking pin. These locks tend to be more complex and therefore more costly, and many of them require an owner to permanently alter his or her gun.

Magloc

As long as you're wearing the magnetic ring shown here, the Magloc will allow the gun to fire. If you drop the gun, the internal lock automatically reengages.

One type of internal trigger block, such as the grip-mounted Magloc ($90, 604/551-8492) from Smart Lock Technology, provides improved safety and fast access by using a magnetic ring. When the gun is grasped by someone wearing the ring, a switch moves inside the special grip cover (which replaces the original grip). This frees an integral grip lever at the rear of the gun. Normal hand pressure then unlocks the trigger bar for firing.

But even better solutions may be coming down the pike. Spurred by the industry's agreement, companies are developing promising, new "smart" systems. Oxford Micro Devices (203/924-9933) is developing a grip with a microchip that stores the thermal imprint of several different fingerprints. If the user's print matches one stored in memory, the gun is functional in a heartbeat. Wrong fingerprint, the gun doesn't fire.

Oxford Micro Devices

A prototype of this experimental lock uses two microchips and a solenoid. The first chip reads and stores fingerprints. If it gets a match, it sends a signal to the second chip, which sends an electrical impulse to the solenoid. The solenoid then retracts the locking pin.

Such technologies will help make guns both child-safe and accessible, and the advances are coming at a good time. Congress is once again taking up the issue of gun safety, and it seems clear that the age of the mandatory gun lock is upon us. The problem is, the greatest lock in the world doesn't do any good if nobody uses it. FM

Home Improvement Journal

Bench Mark

An easy-to-build seat that's a storage bin, as well.

TEXT AND PHOTOS BY NEAL BARRETT

SHOP PROJECT

Every home has an area set aside for boots, hats, scarves, gloves and coats. And, regardless of whether it's the back porch or the front hall, there's a need for both storage and a place to sit down to lace up those boots. Our bench provides for both these needs, with style. It's constructed of solid poplar and birch plywood and is simple enough to build in a weekend or two. And you don't need a lot of fancy equipment. We built the entire piece with basic hand tools and portable power tools.

Poplar lumber is generally available at home centers and lumberyards, and it's usually surfaced to a thickness of 13/16 in. You'll probably find poplar sold, like other hardwoods, in random widths and lengths, so you'll need to do a bit of calculation to determine exactly how much material to buy.

Prepare The Panels

The bench ends and seat are made of edge-glued poplar boards. Based on the width of your stock, determine the number of pieces that you'll need for each panel. Crosscut the wood for the sides 3 or 4 in. longer than the finished dimension. Cut the seat stock 12 in. longer than the finished seat. You'll use the extra length for support cleats and for the ends of the seat frame.

If you're hesitant to use a hand plane to true the mating edges of the boards in preparation for gluing, you can use a router with a straight bit and a straightedge guide. Clamp the edge guide to the work so the bit removes about 1/16 in. from the edge. Then, run the router base along the guide to trim the edge straight and square (Photo 1, page 92). Be sure to move the router from left to right to maintain proper control of the tool.

While a good glue joint is strong enough without any reinforcement, adding dowels makes it easier to align the board surfaces. You might also use splines or a plate joiner to do the job.

Prepare for joining the boards by placing the stock for one panel on your bench so that the annual rings of adjacent boards are oriented in opposite directions. This technique will help keep the panel flat through humidity changes. Mark dowel locations along the joints 6 to 8 in. apart, starting about 3 in. from each end of the panel.

Using a doweling jig to guide the drill bit, bore 13/16-in.-deep dowel holes (Photo 2). Cut 1/4-in. dowel into 1 1/2-in.-long pieces and chamfer the ends of each piece with sandpaper. Note that the dowel pin length leaves room for excess glue that might otherwise keep the joint from closing tightly. Spread a bit of glue in each hole and tap the dowels into place (Photo 3).

Spread glue on the mating edges of the panel boards and join them. Use four or five clamps across the panel to pull the joints tight. Be sure to place the clamps and panel on a flat surface so the panel doesn't twist while the glue sets. After about 20 minutes, scrape off any squeeze-out from the joints, and then leave the pieces overnight so the glue cures fully.

This traditional seating solution for entryways and halls has ample storage space for winter garb.

You can use a hand plane to clean off glue from an assembled panel and smooth any slight misalignment in the joint, but a belt sander is often faster and easier.

Clamp the panel to the workbench and use a 100-grit belt on the sander to smooth the surface (Photo 4). With a belt sander, it's easy to remove too much stock. Keep the sander moving along the panel surface and let the weight of the tool do the work.

After all panels have been assembled, make a template of the end-panel profile out of ¼-in. plywood, hardboard or stiff cardboard. After cutting it to shape, use a rasp, sandpaper or knife to smooth and refine the curves. Then clamp the template to one of the end blanks and trace the outline (Photo 5).

Secure the panel to your workbench and use a sabre saw to follow the cutline (Photo 6). Keep the saw kerf on the waste side of the line. Then, use a spokeshave, rasp or coarse sandpaper to remove the saw marks and refine the curved profile. Repeat the process for the opposite bench end.

1

Use a router equipped with a straight bit to trim board edges for joining. Guide router against straight strip clamped to work.

2

After marking dowel locations, use a doweling jig to guide drill. Place dowel holes every 6 to 8 in. along mating edges.

3

Apply a small amount of glue to dowel holes. Tap 1½-in. dowels into holes. Clamp glued-up panel until glue sets.

4

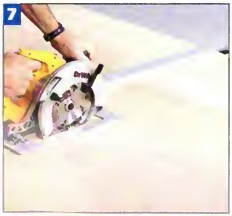
Use a belt sander to smooth panel faces. Keep sander moving evenly across panel and let weight of sander do the work.

5

After making a template of the bench end out of plywood or cardboard, clamp it to the end-panel blank. Trace the outline.

6

Clamp each end panel to your bench for cutting. Use a sabre saw and keep the kerf to the waste side of the cutline.

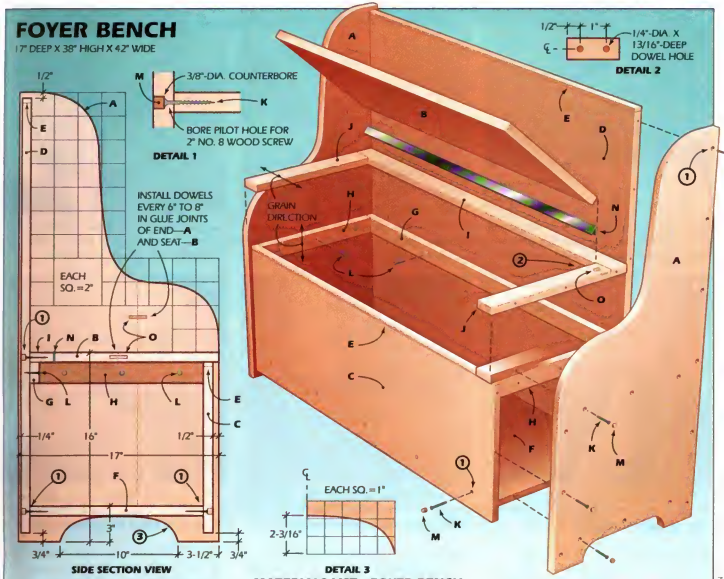
7

Use a circular saw and edge guide to cut the plywood panels to exact size. Cut the panel with the good side facing down.

8

After ripping poplar edge banding and gluing it to front and back panels, trim banding flush with block plane.

9

Use a small backsaw to cut the edge bands flush with the panel ends. Support waste side of cut so it doesn't break off.



MATERIALS LIST—FOYER BENCH

Key	No.	Size and description (use)
A	2	15/16 × 17 × 38" poplar (end)
B	1	15/16 × 13 3/8 × 36 3/4" poplar (seat)
C	1	3/4 × 14 1/4 × 40 3/4" birch plywood (front)
D	1	3/4 × 36 5/8 × 40 3/4" birch plywood (back)
E	2	3/4 × 3/4 × 40 3/4" poplar (edge band)
F	1	3/4 × 14 1/4 × 40 3/4" birch plywood (bottom)
G	1	15/16 × 1 3/4 × 40 3/4" poplar (cleat)
H	2	15/16 × 1 3/4 × 13 3/4" poplar (cleat)
I	1	15/16 × 2 × 40 3/4" poplar (frame)
J	2	15/16 × 2 × 14" poplar (frame)
K	45	2" No. 8 fh screw
L	11	1 1/4" No. 8 fh screw
M	45	3/8"-dia. birch plug
N	1	36"-long 1 1/2" piano hinge*
O		1/4"-dia. × 1 1/2"-long dowel**

Misc: sandpaper, latex primer and paint.
*Stanley No. 47-1640, cut to length.
**as required.

ILLUSTRATION BY EUGENE THOMPSON

Use a circular saw, guided by a straightedge, to cut the plywood panels to finished dimension (Photo 7). Since a circular saw tends to chip out the top side of the cut, it's a good idea to cut the panel with the best side facing down.

Use the rip guide on your circular saw to cut two strips of 3/8-in.-thick poplar edge banding for the top edges of the front and back panels. Cut each strip several inches longer than the finished panel length. Spread glue on one of these strips and clamp it to the top edge of the bench front panel. Center the strip over the plywood edge so that you have an equal overhang on both faces and both ends. Clamp the strip every 3 in. to provide a good, tight joint. Scrape off any glue squeeze-out after 20 minutes and let the glue set. Repeat for the back panel.

Use a block plane to trim the edge banding flush to the panel faces (Photo 8). If you notice that the wood is tearing out, reverse your planing direction. Proceed carefully so that you don't cut through the thin veneer on the panel.

Use a small backsaw to cut the edge band flush with the panel ends (Photo 9). Be sure to keep the saw square and support the waste piece at the end of the cut so it does not break off.

Assembly

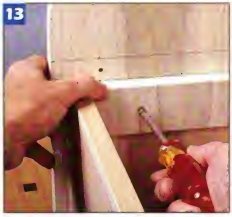
Mark the outlines of the front, back, bottom and seat on both sides of each bench end panel. Mark the outlines of the bottom on the front panel and both the bottom and seat frame on the back panel. You'll use the outside outlines for accurately locating screwholes, and the inside outlines for positioning the parts during assembly.

Bore screw clearance holes for No. 8 screws where required in the

Mark outlines on both sides of panels and bore screwholes. Combination bit bores hole and plug counterbore in one step.

Clamp front panel to bench bottom. Position the parts accurately and then bore screw pilot holes into edge of bottom.

Support the bench subassembly on ¾-in. blocks. Clamp a bench end in place, bore pilot holes and attach with screws.



Cut seat supports to size and screw them in place. Note that the grain of the side runs vertically to match end panels.

Use dowel joints to attach side seat frame pieces to back piece. When the glue has dried, screw seat frame to bench.

After gluing plugs into screwhole counterbores, use a chisel to remove excess. Sand entire bench and ease all edges.

bench ends, and front and back panels. Counterbore these holes for ⅜-in.-dia. wood plugs. If you use a combination drill and countersink (Photo 10), you can accomplish this task in one step.

Begin assembly of the bench by clamping the bottom panel to the front so the bottom is aligned with the inside layout marks on the front. Bore pilot holes into the edge of the bottom (Photo 11), then fasten the two parts with 2-in. No. 8 screws. Next, clamp the back panel to the bottom, bore pilot holes and fasten it in place.

Place ¾-in. scrap blocks underneath the front and back panels to provide the proper spacing, then clamp the bench ends in place. Carefully align the parts on the layout lines, bore pilot holes (Photo 12) and attach the ends.

Rip a strip of poplar to 1¾ in. wide for the back seat support, cut it to length, bore screwholes and fasten it to the back panel. The side support strips must have their grain running parallel to that of the bench ends. If the grain of these strips ran perpendicular to that of the ends, seasonal movement might cause the ends to split. Cut these strips off the end of the bench seat blank and screw them in place (Photo 13).

Cut the seat frame pieces to size. As with the side support strips, the grain of each end frame piece must run across its length. Cut these two pieces from the seat blank. Lay out the dowel locations for each frame joint, then use the doweling jig to bore the holes. Apply glue to the dowel holes and mating edges, tap the dowels into position and join the parts (Photo 14). Use clamps to pull the joints tight and check that the assembly is square. Slide the seat frame into position, bore pilot holes into the edges of the frame and fasten it in place. Cut the seat panel to finished size so there is a uniform ¼-in. gap at each end of the seat when it is fit into the frame.

We used a commonly available 48-in.-long piano hinge to mount the seat. Clamp the hinge to your bench and cut it to 36 in. long.

Hold the hinge in place on the back edge of the seat and mark the locations of all screwholes. Bore ⅛-in.-dia. pilot holes for the screws, and then fasten the hinge to the seat. Lay the bench on its back and place the seat in the open position so that you can mark the hinge-screw locations on the back of the seat frame. Bore pilot holes and fasten the seat to the bench.

Use a small brush to apply glue to each counterbored screwhole, and tap a ⅜-in.-dia. plug in each hole. After the glue has set, use a sharp chisel to pare the plugs flush to the panel (Photo 15). Then sand the entire bench, finishing with 120-grit paper. Slightly soften all edges.

We finished our bench by applying a latex primer, then sanding lightly and finally brushing on a semigloss latex topcoat. PM

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Weaving A Rush Seat

BY THOMAS KLENCK
Illustrations by
George Retseck

A woven rush seat is one of the most popular ways to finish a traditional rung-frame chair. Originally, a rush seat was woven with heavy strands made by twisting cattail leaves. If you don't live near an area where cattails grow, however, you can still weave a seat. Pretwisted natural rush is available to make the job easier. For our chair, we chose fiber rush—a material made from heavy brown paper, twisted to form a strand. Fiber rush is a sturdy, long-lasting substitute that is almost indistinguishable from the real thing. Both natural and fiber rushes are available from Constantine, 2050 Eastchester Rd., Bronx, NY 10461.

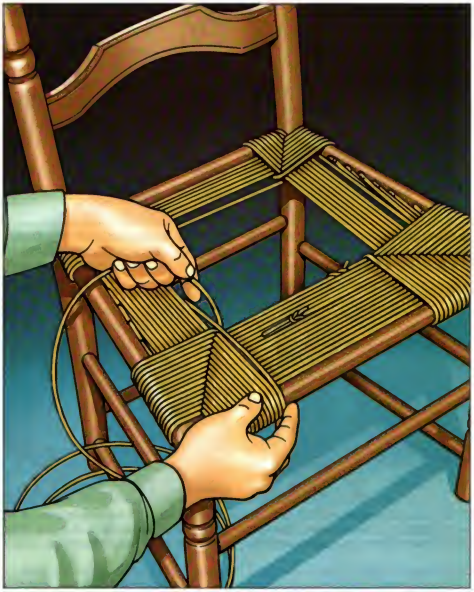
FURNITURE MAKING

Fiber rush comes in various diameters. We used 5/32-in.-dia. rush for our average-size chair, while 3/16-in. rush would have been appropriate for a larger seat. The material comes in a coil and is ready to use—3 to 4 pounds should be enough for a typical chair.

Seat Types

The simplest seats to weave are those with rectangular or square frames. Here, weaving begins at one corner and continues around the chair until the area has been filled (see diagram on page 99). However, most rung-style chairs, including the one we worked on, have a trapezoidal seat—that is, the front rung is longer than the back and the side rungs angle toward each other at the rear of the chair.

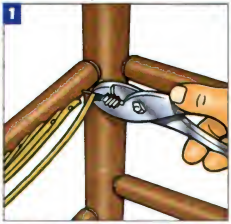
To add the extra strands required on the longer front rail, triangular sections of the seat on each side are woven first. This is done with a number of separate strands that move down one side, across the front and up the other side.



Some trapezoidal seats have corner square blocks at the front legs. These blocks equalize the rung length between front and back to allow the chair to be woven as if it were rectangular.

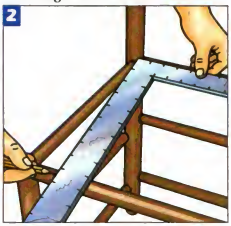
Preparing The Chair

Start by cutting away the old seat with a utility knife. Our chair had been woven with fiber rush and the starting strands were secured to the side rungs with tacks. Pull the tacks



1

The old starting strands on our chair were secured with tacks. Use a pair of pliers to remove the tacks and pull away the strands.

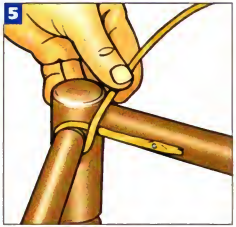


2

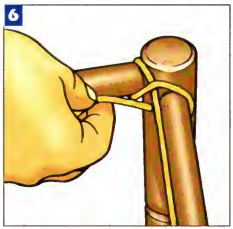
Use a framing square to mark length of back rail on front rail. Triangular area on each side is woven with separate strands.

Cut the first length of fiber rush to a little more than twice the front rung length. Dip the coil in warm water to dampen it.

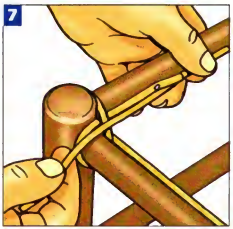
Tack first strand to left side rung. Position the tack so the strand is square with the front rung as it passes inside of front leg.



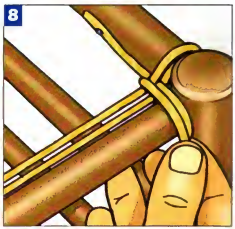
Wrap the strand over and around the front rung, then up and over the left side rung. Keep strand tight against leg.



At the right leg, pass strand over and around right side rung, then over front rung. Tack strand to side rung and trim excess.



Start the second strand by tacking to left rung a little beyond the first strand. Then, repeat the turns around the left leg.



Hold the strand taut and move to the right leg. After carrying the strand around both rungs, tack it to side rung.

with a pair of pliers (Fig. 1). In natural-rush seats, the starting strands may have been tied to the rungs.

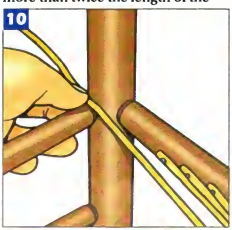
With the old seat removed, use a framing square, or large square piece of cardboard, to mark the extent of each triangular side section on the front rail. Hold one leg of the square in line with the back rail and against the rear leg, and make a pencil mark on the front rail (Fig. 2). Repeat on the other side.

Weaving The Seat

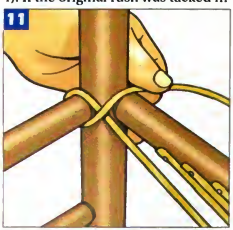
Cut a length of fiber rush to a little more than twice the length of the front rail. Dip the strand in warm water to dampen it (Fig. 3). Don't soak the strand or the paper will quickly deteriorate.

Then, use a small hammer to tack the end of the first strand to the left (as you face the chair) side rail (Fig. 4). If the original rush was tacked in

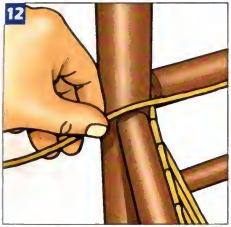
When the pencil mark is reached, the separate side strands are complete. Make sure strands are pushed tightly together.



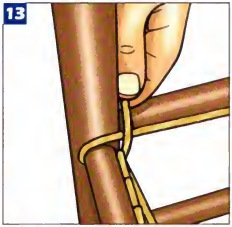
With the triangular side areas finished, carry strand on right side to back rung instead of tacking it to side rung.



Wrap strand over and around back rung, around right rear leg, and then over and around right side rung.



At left rear corner, repeat weaving procedure. Bend tight strand over left rung while holding it against left rear leg.



Carry strand around left rear leg, then bring strand to left front leg. Continue weaving from one corner to the next.

When you reach the end of your strand, tie a new length to the old with a square knot. Trim excess with scissors or knife.

Use a block of wood to tap strands together as you progress. Try to keep front-to-back strands square with front rung.

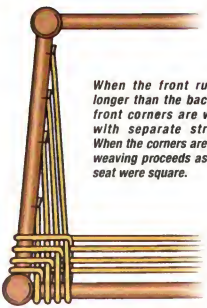
Use corrugated cardboard for seat padding. Cut pieces to fit between strand layers. Leave an opening at center.

After side rungs are filled, carry strands up through center, around front rung, then back up through the center and around rear rung.

place, you can use the tack holes as placement guides. If not, tack the strand so that as it's carried past the inside of the front leg, it will be roughly square with the front rung.

Next, pull the strand over the front rung. While holding it tight against the front leg, wrap it around and under the front rail, then up and over the left side rail (Fig. 5). Wrap the strand around and under the left side rail and carry it to the

On a square seat, weaving proceeds from one corner to the next until the area is filled. Each corner is woven in the same way—the strand first goes over and around a rung, then wraps around the leg to go over the adjacent rung.



When the front rung is longer than the back, the front corners are woven with separate strands. When the corners are filled, weaving proceeds as if the seat were square.

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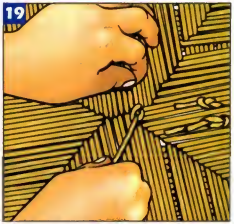
18

Continue this figure-8 weaving from front to back until rungs are filled. Use a screwdriver to make space at center.



19

When the front and back rungs have been filled, tie off the last strand underneath the chair. Finish seat with polyurethane varnish.

other side. Keep the strand tight.

At the right leg, carry the strand over the top of the right rung, bring it underneath, then up and around the front rung next to the right leg (Fig. 6). Tack the strand to the right rung at the position that matches the spot where you started the strand on the left side. Cut away the excess.

Now that the first strand is in place, repeat the process until the rush along the front rung reaches the pencil mark. Cut the next strand to estimated length and dampen it. Tack this piece in place on the left rung, placing the tack slightly farther up on the rung. Then, pull the strand across the front rung (Fig. 7), wrap it down and around the front rung, and up and over the side rung. Carry the strand to the opposite side, repeat the process (Fig. 8) and tack it to the right rail. To get an idea on how to space the tacked ends, estimate how many strands it will take to reach the pencil mark on the front rung. This is the number of strands that must be spaced along and tacked to the side rungs.

Keep the strands tight as you weave. Try to keep the front-to-back weaving perpendicular to the front rung, and the side-to-side strands parallel to the front rung.

After you reach the pencil mark, you can weave as if the seat were square (Fig. 9). While you could weave the rest of the chair with one continuous length, it's easier to work with shorter lengths, tying them underneath when necessary. Cut off a length equal to about 12 turns of your coil. Keep the length in its coiled shape and dip it in warm water to dampen it. Tack one end to the left rung near the back leg and weave it around both front legs in the manner described. However, instead of tacking it to the right rung, carry it over the back rail (Fig. 10). Then, bend it down and around the back rung, up and over the right side rung (Fig. 11) and around and across to the left rung (Fig. 12). At the rear left leg, carry the strand over the left rung, then up and over the rear rung (Fig. 13). Continue weaving from one corner to the next.

When you reach the end of the strand, simply tie a new one in place using a square knot (Fig. 14). As you progress, keep the strands tightly packed by tapping them together with a wooden block and a hammer (Fig. 15). Most rush seats are padded to add body and stiffness. Cut corrugated cardboard into shapes that will fit between the strand layers on each side of the seat (Fig. 16). Leave an opening at the middle of the seat.

If the seat is wider than it is deep, you'll end up with a space in the center of the front and back rungs when the sides are finished. To weave this space, simply carry the strand around the front rung, up the gap in the center and around the back rung (Fig. 17). Use a screwdriver to make space for the last few strands (Fig. 18). Repeat this figure-8 weaving until the gap is filled and tie off the end with a knot (Fig. 19). To protect the fiber rush, finish it with polyurethane varnish. PM

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Chisel Basics

The tool of choice for fitting, trimming and shaping wood.

TEXT AND PHOTOS BY ROSARIO CAPOTOSTO

While there are many woodworking hand tools that are useful in a modern shop, there are only a few that are truly indispensable. Near the top of the list is the chisel. Here's a tool that does it all—from quickly removing waste wood in large chunks, to carefully paring away thin shavings for that glovelike fit. And you'll find chisels used in just about every area of woodworking, from trim carpentry to woodcarving to furniture making.

There are many types and sizes of chisels, each designed for a specific job. If you're getting started, consider buying a 4-piece set made up of ¼-, ½-, ¾-, and 1-in. bevel-edged bench chisels with blade lengths of 4 to 6 in. Plastic handles are a good idea because they are comfortable to hold and they stand up to being struck with a mallet. If you only buy one, get a ¾-in. chisel. Be sure to buy a reputable brand because quality steel means the tool will take a sharp edge and hold it longer.

TOOL TECHNIQUES

Using The Chisel

If you've never used a chisel, there are two basic rules to remember. First, always keep the tool pointed away from you when in use—if the chisel slips, the worst place to be is at the cutting end. Second, always make sure that your tool is razor-sharp.

For many operations, the chisel is held with both hands—one on the handle to apply cutting pressure and the other on the blade to guide the cut (Photo 1). When greater cutting force is required, shift the guide hand to the chisel handle and use a mallet to strike the handle end (Photo 2).

Whenever possible, cut with the grain—the grain should slope up and away from the tool—to achieve a clean, controlled cut. When the chisel is driven against the grain, the bevel tends to wedge into the wood, splitting out large chunks in an uncontrolled manner (Photo 3).

1

For careful paring, use a 2-handed grip. One hand guides the cutting edge while the other hand provides driving power.

2

When greater cutting force is required, wrap one hand around the handle and use a mallet to drive the chisel.

3

Cutting against the grain, as shown, will cause the chisel edge to dig in and split the wood. Always cut with the grain.

4

While most light cuts are made bevel up, heavier cuts or confined spaces may require the chisel to be used bevel down.

To cut a notch, first define the perimeter with vertical cuts. Then, make slanted bevel cuts to reach recess depth at edges.

With the walls of the notch finished, remove remaining waste with paring cuts. Keep the bevel up and hold the chisel flat.

When paring thin slices from endgrain, orient the chisel bevel up, and use a swiveling motion for smooth cutting.

To accurately trim the depth of a rabbet, use a block that matches the rabbet lip as a guide. Rest the chisel on block as you cut.

Deep mortises are best made by first boring a series of overlapping holes. Then, use a chisel, bevel side up, to remove the waste.

Make concave cuts with the bevel down. Gradually press the handle down as the blade is advanced through the workpiece.

Whether the bevel faces up or down depends on the nature of the cut. Generally, the bevel is up for paring—slicing off waste in thin layers—and down for roughing cuts (Photo 4).

Basic Cuts

To cut a notch or shallow mortise at the edge of a board, start by laying out the notch edges with a knife groove. Then, with the bevel facing the waste area, set the chisel edge in the scored line, hold the chisel vertically and tap it with a mallet to make incisions around the perimeter. With the bevel down, make slanted cuts from the stock face to the perimeter incisions to form the notch walls (Photo 5). After bringing the angled perimeter cuts to the desired depth, turn the chisel bevel up and cut across the grain to remove most of the waste (Photo 6). When the notch has reached its approximate final size, use light cuts to bring it to the exact size and depth you need.

When paring endgrain, you'll find that the cut goes more easily and smoothly if you use semicircular sweeps, with the trailing edge of the blade doing the cutting. Use a wide chisel, bevel up (Photo 7).

As an aid when cutting a rabbet to a precise depth, it helps to use a block whose thickness matches the rabbet lip as a guide. Clamp the work and the guide block to your bench and hold the chisel flat against the guide for the final cuts (Photo 8).

The quickest and easiest way to cut a deep mortise is by first boring a series of overlapping holes using a drill bit that's slightly smaller than the width of the cavity. Then use the chisel to shave away the waste between the holes (Photo 9). When working in corners, always make crossgrain cuts first to prevent long-grain splitting.

To trim along a concave curve, use a chisel that is slightly wider than the thickness of the stock. With the bevel down, press down on the blade while pivoting down on the handle and pushing forward (Photo 10).

Sharpening

A sharp cutting edge is essential for clean and fast cutting, as well as for personal safety. Not only does a dull tool create a coarse cut, but the extra force required to drive the tool can lead to loss of control.

Maintain a keen edge on a chisel by regularly honing it on an oil or water stone. The cutting edge bevel is usually 25° to 30°, but you don't have to hone the entire bevel. Instead, hone a small secondary bevel at the tip to a slightly steeper angle than the main bevel.

Seat the main bevel firmly on the stone, then raise the chisel handle slightly higher, about 5°. Move the blade back and forth until a wire edge forms on the back of the blade. Then, turn the blade over, lay it perfectly flat on the stone, and slide it a few times to remove the wire edge. As a test for sharpness, pare across endgrain. You should hear a crisp sound as a clean, curled shaving peels away from the wood. FM

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APR. 4	HOMESTEAD MOTORSPORTS COMPLEX HOMESTEAD, FL	TNN
APR. 19	PHOENIX INTERNATIONAL RACEWAY PHOENIX, AZ	ESPN2
APR. 25	PORTLAND SPEEDWAY PORTLAND, OR	TBS
MAY 9	EVERGREEN SPEEDWAY MONROE, WA	TBS
MAY 23	I-70 SPEEDWAY ODESSA, MO	TNN
MAY 30	WATKINS GLEN INTERNATIONAL WATKINS GLEN, NY	ESPN
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JULY 30	INDIANAPOLIS RACEWAY PARK INDIANAPOLIS, IN	ESPN
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AUG. 8	FLEMINGTON SPEEDWAY FLEMINGTON, NJ	TNN
AUG. 15	NASHVILLE SPEEDWAY USA NASHVILLE, TN	TNN
AUG. 23	HEARTLAND PARK TOPEKA TOPEKA, KS	TNN
AUG. 29	LOUISVILLE MOTOR SPEEDWAY LOUISVILLE, KY	ESPN
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SEPT. 13	MEMPHIS MOTORSPORTS PARK MEMPHIS, TN	ESPN
SEPT. 19	GATEWAY INTERNATIONAL RACEWAY ST. LOUIS, MO	TNN
SEPT. 26	MARTINSVILLE SPEEDWAY MARTINSVILLE, VA	ESPN
OCT 11	SEARS POINT RACEWAY SONOMA, CA	ESPN2
OCT 18	MESA MARIN RACEWAY BAKERSFIELD, CA	TNN
OCT. 24	PHOENIX INTERNATIONAL RACEWAY PHOENIX, AZ	TBS
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Homeowners Clinic

BY NORMAN BECKER, P.E.
Illustrations by George Retseck

Tuckpointing Mortar Joints

My brick home was built in 1963, and the mortar is coming out from between the bricks on the gable end wall. Can the mortar, by itself, be repaired?

RALPH CRARY
GOODLETTSVILLE, TN

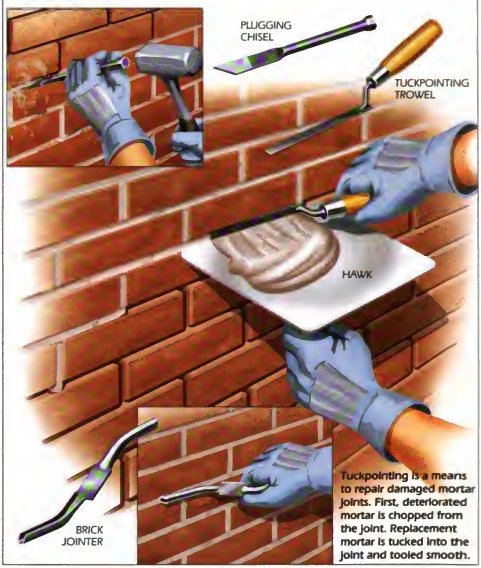
It's very important to maintain the integrity of the mortar joints in a brick wall. Otherwise, deteriorated mortar joints become a conduit for water leakage through the wall. There are two repair methods that are considered to be effective in stopping water migration through a brick wall. One is grouting and the other is tuckpointing.

Grouting is normally used on hairline cracks in mortar joints. In this method, a thin mixture of portland cement, lime and sand is applied to the mortar joints using a stiff fiber brush. Two coats are applied, and the grout is forced into the cracks. The problem with this method is that the grout is smeared over the bricks' surface, which drastically changes the appearance of the wall. Tuckpointing is better than this method because a tuckpointed wall looks neater and is more durable than one that has been grouted.

Although we can't take the space here to describe tuckpointing completely, here's an overview of the process: The deteriorated mortar is removed to a depth of about 3/4 of an inch, or to the point where solid mortar is reached. The mortar is removed using a tuckpointing chisel hit by a metal-striking hammer such as a small handheld sledge (not a claw hammer or brick hammer). Debris and dust are brushed from the joints and the joints are gently hosed clean. When surface moisture has evaporated, the joints are packed tightly with tuckpointing mortar in three successive layers and tooled with a brick jointer to match the original profile.

Tuckpointing mortar is made with carefully measured ratios of cement, lime and sand. For a full explanation of tuckpointing, contact the Brick Institute of America, 11490 Commerce Park Dr., Reston, VA 20191. Ask for a copy of "Brick Technical Note 7F, Moisture Resistance of Brick Masonry, Maintenance." Include $1 with your request to cover postage and handling.

TUCKPOINTING



Tuckpointing is a means to repair damaged mortar joints. First, deteriorated mortar is chopped from the joint. Replacement mortar is tucked into the joint and tooled smooth.

Review: Help With Files

The basics of file use are not widely known beyond the ranks of some industrial trades, but it's handy for a homeowner to know how to choose and use a file, especially when a hobby or repair involves precise metalwork. The Nicholson booklet has been around for years, and in its own small way it's something of a classic in manufacturers' literature. We were glad to learn that it's still in print. It discusses the basic types of files for removing wood, plastic and metal. Also, it explains the techniques for hand filing and filing an object as it turns on a lathe. The booklet is free. Send a card or letter with your name and address to: Marketing Communications Manager, Cooper Tools (Nicholson Brochure), P.O. Box 30100, Raleigh, NC 27622.

—Roy Berendsohn

Municipal Water Pressure Prompts Valve Discharge

The relief valve on my water heater opens, and it got so bad that I had to use a 20-ft.-long vinyl hose to discharge the water into the sump

pump basin. How can I prevent this waste of water and energy?

CHARLES DEPALMA
VERONA, NJ

The problem you describe is a reasonably common one. Many municipalities require a backflow preventer on a building's inlet water service pipe to prevent contamination of the municipal water supply. When the faucets in a house are closed, the water distribution piping becomes a closed system. When water is heated it expands. In a closed system, there is no room for the expansion, so the water pressure will increase. This can cause the water heater's pressure relief valve to drip. To absorb this pressure, a precharged bladder-type expansion tank is installed on the cold-water inlet near the water heater. This is similar to the tanks used on hot-water heating systems.

When the water expands, it flows into the tank and presses against the bladder. The air behind the bladder is compressed, and the pressure in the house's water system does not increase appreciably. When water is drawn from a fixture, the water from the tank flows back into the system. Two manufacturers of these tanks are: Amtrol, 1400 Division Rd., West Warwick, RI 02893 and Flexcon, P.O. Box 782, 300 Pond St., Randolph, MA 02368.

Lime-Bleeding Chimney

I have a beautiful fieldstone chimney, which is 10 years old. However, lime keeps bleeding from the chimney and staining the stones. I have cleaned the chimney using muriatic acid, but the lime comes back. Do you have any advice?

DAVE GUYER
HUDSON, MA

The white powdery deposits on the mortar joints are called efflorescence. The fact that you continually remove an efflorescence buildup indicates that water is working its way into the mortar joints either through cracks or open joints at the top or sides of the chimney.

Efflorescence is caused by mineral salts in the mortar that dissolve in water as water passes through the mortar joint. When the water evaporates from the surface of the joint, the salts are left behind.

Check the chimney closely. The top should slope away on all sides from around the flue to the chimney edge. The slope deflects rain and protects the joint between the flue and chimney. This sloped surface is vulnerable to cracking and periodic sealing of this area is required. Other cracks and open joints should be sealed.

For more information on efflorescence, contact the Portland Cement Association, Dept. EF, 5420 Old Orchard Rd., Skokie, IL 60077. Send a self-addressed stamped envelope and request "Trowel Tips, IS239.01M."

Make Your Mark

SERVICE TIP: CARPENTRY

Almost all the marking and layout you do for woodworking around the home can be accomplished with a No. 2 pencil, yet there are advantages to also using a carpenter's pencil or a marking knife. The No. 2 excels at marking lines for furniture construction, and it can be used for general carpentry. Also, its awl-like tip can be used to accurately mark miters for finish carpentry. The carpenter's pencil is more rugged than the No. 2, and if you sharpen a carpenter's pencil to a chisel point it can mark nearly as fine a line as the No. 2. In a pinch, the thickness of a carpenter's pencil helps it scribe. Run the broad face of a carpenter's pencil along an uneven surface to mark a contour line on a piece of lumber. Sometimes it's actually handier for this application than a drafting compass. Finally, the marking knife cuts a hair-thin line into a surface, and the line won't smudge off. To use it, measure over and press the point of the knife into where you wish to mark. Gently slide the square against the knife and scribe the line. —*R.B.*

Aluminum Siding Repair

How can I repair the bottom two courses of aluminum siding on my home? I don't want to remove the siding all the way down from the top. I have several courses of new, unused siding in storage that I can use for the repairs. Thanks for your help.

JAMES MARKLAND
SKOKIE, IL

It isn't necessary to remove the aluminum siding from the roof level down, in order to repair the two damaged sections of siding at the bottom of the wall. The following procedure is based on recommendations by the American Architectural Manufacturer's Association (AAMA), the trade group of aluminum building products manufacturers.

Cut the top damaged panel along its length at a point just above its center. This can be done using a utility knife and tin snips. Remove and discard the lower section of this panel. The nailed portion of the bottom damaged panel will now be exposed. Remove the panel and replace it with one of your new panels. Make sure you nail it properly so that it can expand and contract with temperature changes.

Apply a heavy coat of gutter seal along the full length of the cut panel. Remove the top lock portion of the new panel by scoring it with a utility knife and snapping it off.

Install the new panel over the gutter seal. Tuck the top of the new panel under the lock of the panel above and snap the bottom lock in place. Be sure the gutter seal makes contact with the new panel. Apply gentle pressure with your palm. Also, do not nail the repair panel in place.

For more information on aluminum siding, contact AAMA, 1827 Walden Office Sq., Suite 104, Schaumburg, IL 60173. PM

DO YOU HAVE A HOME-MAINTENANCE OR REPAIR PROBLEM?

Just ask Norman about it. Send your question to Homeowners Clinic, Popular Mechanics, 224 W. 57th St., New York, NY 10019. While letters cannot be answered individually, problems of general interest will be discussed in the column.

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BY MIKE ALLEN

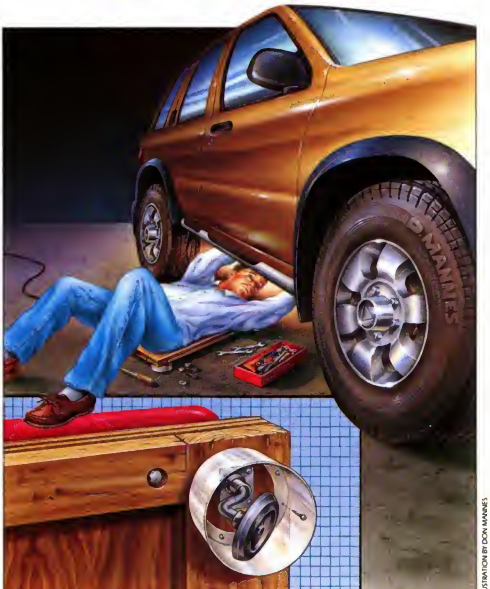


ILLUSTRATION BY DON MANNES

I Can't Believe It's Not Butter

My wife bought me a really nice creeper for my birthday. But it never seems willing to roll along the floor. It just snags its casters on any little nut or bolt, the cord to my droplight and even fair-sized tools. How do you get your creeper to roll?

DAVE THOMPSON
VIA INTERNET

I've experienced the same problem you have trying to get a creeper to roll. You need to have a smooth concrete floor or driveway to work with (I'm still searching for the perfect off-road creeper, with big, soft rubber tires that will roll over gravel. But if I ever find it, I guarantee it won't fit under the Porsche, just the 4x4 pickup. Ah, well). I screwed plastic margarine tubs over the casters. Start by removing the casters, by simply unscrewing the wood screws holding them to the frame. Put the margarine tubs on the frame, and reinstall the casters. You'll almost certainly need to trim the tubs to let the casters down onto the pavement. Now the lip of the tub will sweep any tools, cables, hardware or large pieces of dirt out of the way as you creep.

Occasional Bouts Of Temper

I have a 1995 Pontiac Grand Am with the 3.1-liter V6. I had the serpentine belt and coolant changed as part of a regular tuneup. The LOW COOLANT light was on when I picked up the car. They told me it would go away in a few days, which it did. But now, intermittently, the temp gauge shoots up to 200° to 220° F, when it used to run a solid 185° all the time.

JEREMY SWISTAK
EILESON AIR FORCE BASE, AK

Shame on that shop for letting your car out the door with a warning lamp lit. Your cooling system wasn't properly purged of air after they replaced the coolant, and there's an air bubble making it run hot. Take it back, and insist they bleed the system per Pontiac's shop manual. This is an increasingly common problem on modern cars with low hood profiles and radiators that are physically lower than the cylinder head.

Manifold Destiny

I've seen a lot of old cars with their air injection systems disabled in various ways—manifold tubes cut and crimped, manifold port holes plugged, etc. Is it okay to do this to my old car? Specifically, will I notice any difference (in performance, not emissions) if I remove the entire air injection system, pump and all, and plug the holes? Two, does the system really even reduce emissions? Doesn't it just dilute the exhaust to fool the emissions sniffer by adding fresh air?

JAMES ALLEN
VIA INTERNET

Wrong, wrong, wrong. It may very well be illegal to remove ANY emissions control equipment, depending on where you live. Removing it will certainly make it impossible to pass

Car Care

any emissions check that includes a visual check for emissions equipment, for instance in California. Here are the facts: An air injection system provides air to the inlet of the catalytic converter to provide an excess of oxygen for the catalyst to burn pollutants, specifically unburned hydrocarbons, inside the cat. So it does indeed reduce the emissions. Your neighborhood smog station uses a tailpipe sniffer that can only measure the percentage of the combustion gases exiting your tailpipe. Injecting a large amount of air into the exhaust might fool this gadget. But the EPA uses a highly sophisticated smog measuring machine that runs a car on a chassis dyno and collects all of the pollution from the tailpipe to give an emissions reading on a true grams-per-mile basis, which is the standard your car is required to meet. Don't do it.

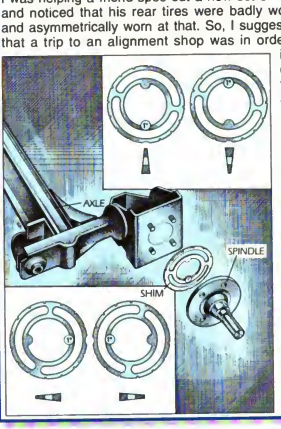
Grounded!

I own a '93 Chevy Caprice wagon. Whenever I open the glovebox door the radio shuts off and the

Line Up Over Here

CAR CARE TIP

I was helping a friend spec out a new set of tires and noticed that his rear tires were badly worn, and asymmetrically worn at that. So, I suggested that a trip to an alignment shop was in order before the new tires were installed. But he said his owner's manual said his rear wheels were permanently aligned at the factory, that no adjustments were possible or necessary.



Balderdash. True, the rear wheels of many small front-drive cars have no provision at the factory for alignment, but the aftermarket has found a way to sell (like they sell wax for no-wax floors) alignment kits for unalignable cars. It might be like the illustration, a shim kit that can change camber or caster, or eccentric bolts and washers or some other way to move the alignment back into place, but it probably can be done. Any good alignment shop will know how and where to get the parts from their aftermarket supplier.

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GATE AJAR light comes on. Also, when I try to use the rear wiper, the clock gets all messed up and I lose all the radio presets.

MIKE KNEPPAR
VIA INTERNET

You've got an intermittent ground connection, probably somewhere under the dashboard.

Stealth Bearing

I'm retired, and I've replaced a lot of bearings in my life. I have a '92 Toronado with approximately 96,000 miles. Recently, there was a roaring noise between 40 and 50 mph. It vanished over 50, went away below 40, and changed its sound if I turned. Braking made it go away as well. I replaced the bearing in the hub and all is well. Examination of the used bearing revealed no evidence of failure—the lube was still okay and it rotated smoothly in my hand.

LEROY MONTGOMERY
HARRISVILLE, PA

Modern front-wheel-drive wheel bearings are a different beast from the conical roller bearings on the rear-wheel-drive cars and trucks we grew up with. They generally last the life of the vehicle with no maintenance. They're generally a double-row ball-bearing design, and they are installed with substantial preload, while conical bearings have little preload, if any. Preload means the bearings are squeezed a few thousandths at assembly. In a front-wheel-drive bearing, this is done by torquing the axle nut to a preset figure, generally several hundred foot-pounds. Your bearing was worn out to the point where the preload was gone, allowing it to generate a rumbling noise. PM

DO YOU HAVE A CAR PROBLEM?
Just ask Mike about it. Mail your question to Car Clinic, Popular Mechanics, 224 West 57th St., New York, NY 10019. While letters, faxes or phone calls cannot be answered individually, problems of general interest will be discussed in the column.

SERVICE TIPS

- A computer reprogramming can get rid of persistent chuggle/surge on the highway in 1996-97 GM trucks with the 5.7-liter V8 and 4-speed automatic. Fuel economy will be affected. Technical service bulletin (TSB) No. 77-71-53.
- Ford offers a rear wheel camber kit (PN E7DZ-5K751-A [wagons] - B [sedans]) for 1986-97 Taurus/Sable models to improve wear on the tires' inner edges. TSB No. 96-26-3.
- Chrysler says it's okay to use "national brand" propylene glycol coolant if it meets Chrysler MS-7170 or ASTM D5216 specifications. TSB No. 07-03-97.
- Isuzu says radial tire construction often forms slight indentations in the sidewalls but they won't affect performance on any vehicle. TSB No. SB94-08-001.
- Is brake fluid leaking from the left front corner of your 1994-96 Honda Accord? If the car was built in Ohio, the plugs in the ABS modulator probably need tightening. TSB No. 96-050.

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Dr. Connie H.
Clarksville, OH

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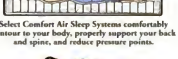
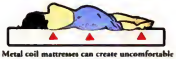
Select Comfort Air Sleep Systems comfortably contour to your body, properly support your back and spine, and reduce pressure points.



Metal coil mattresses can create uncomfortable pressure points and provide uneven support over time.



Many waterbeds can cause a "hammock effect" as the water beneath you displaces resulting in a bending of the spine.

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Automotive Car Care

Mechanic Online

BY PAUL WEISSLER

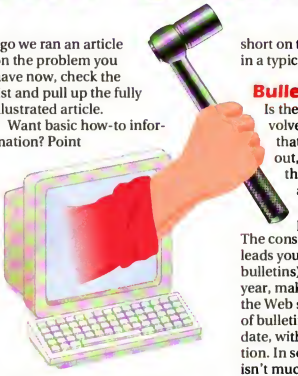
Having car trouble that you can't figure out? Or need some guidance to make a repair? If you have access to the Web, you can get help any time, any day—from POPULAR MECHANICS and the companies that make the parts and tools you're using.

It's easy to search the Web if you know where to look. Although new Web sites go up every day, the major companies have had them for a long time—and keep upgrading them. And if you go to periodically updated lists of manufacturers and their Web sites, you can pick up the new ones.

AUTO REPAIR

The PMZone is a great place to look first. If you check the Automotive area, you'll be able to select from a broad array of Saturday Mechanic features that have appeared in the last four years. So if you remember that not long ago we ran an article on the problem you have now, check the list and pull up the fully illustrated article.

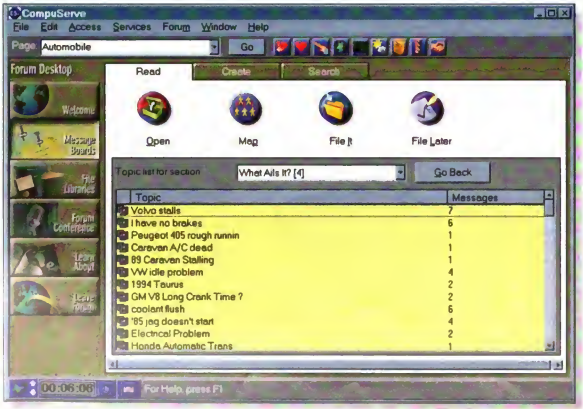
Want basic how-to information? Point your browser to www.autosite.com to find Owning Your Car and, under it, a choice of repairs and maintenance, or reference materials. Both have details on doing a broad range of jobs, but are very short on the illustrations that appear in a typical Saturday Mechanic.



Bulletins

Is there a factory problem involved, and perhaps a bulletin that provides the fix? To find out, go to www.alldata.com, the URL for a leading automotive service information provider for professional mechanics. The consumer information section leads you to TSBs (technical service bulletins), and if you plug in the year, make and model of your car, the Web site provides you with a list of bulletins by number and issue date, with a one-sentence description. In some cases the description isn't much, but in others it could be a good lead, such as "Intermittent pull under hard braking—vehicles with ABS" (antilock brakes). If that's your problem, it's worth finding out if the factory fix applies by checking the bulletin. There are many ways to get factory bulletins, including the POPULAR MECHANICS CD-ROM for your car.

Less comprehensive sources of factory bulletins, but with specific details on those bulletins covered, are at Web sites of two trade associations: the Automotive Parts Rebuilders Association (www.apra.org) and the Automotive Engine Rebuilders Association (www.aera.org).



Questions?

Ask a mechanic via a note or e-mail. CompuServe has a forum in its auto-

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2 SMALL ENGINE SERVICE & REPAIR

Even simple repair jobs cannot be performed by the average small engine owner. With over 65,000,000 small engines in use across the nation (and that number grows by 1,000,000 each month), It's easy to see why small engine repair and service is a golden career opportunity. With specialized skills and knowledge you can earn as much as $49.94 for a simple tune-up that will take about an hour of your time.

3 PROFESSIONAL SAW AND TOOL SHARPENING

Imagine a business where 90 cents out of every dollar you take in is cash profit! Best of all you work right at home; all it takes is a corner of your garage. Typical earnings are $18-$30 an hour and more . . . and you are in charge. Foley-Belsaw provides everything you need to master the craft, including your own professional Sharp-All machine.

4 VCR CLEANING, MAINTENANCE & REPAIR

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5 TV/SATELLITE DISH SERVICE AND REPAIR

You see them popping up in yards all over town. The market for satellite dishes will continue to grow to satisfy the demand for variety in entertainment. Get the skills you'll need to profit.

6 PROFESSIONAL GUNSMITHING

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As furniture prices rise and quality noticeably decreases, more and more individuals and businesses are turning to skilled craftspeople to restyle and upholster furniture, much of which would have been discarded a few years ago. With the Foley-Belsaw course, you'll become an upholstery professional, utilizing your knowledge for a full-time career, part-time career, or a satisfying, money-saving hobby.

9 VINYL REPAIR

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11 COMPUTER REPAIR, MAINTENANCE, UPGRADE

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13 PC SPECIALISTS

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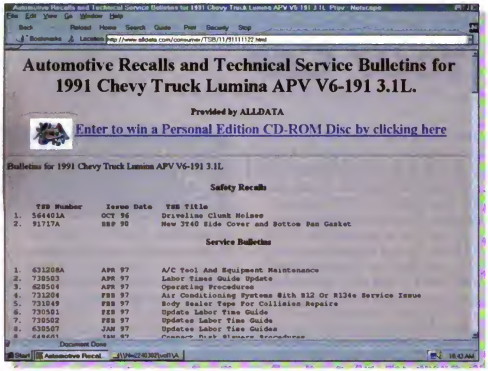


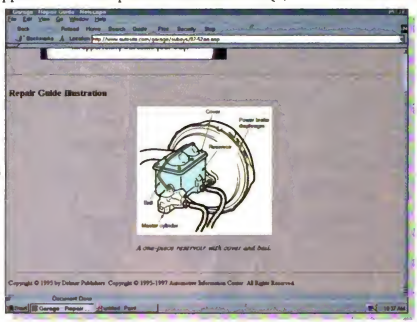
mobile area called What Ails It? Post your question and you're likely to get answers from friendly professional mechanics all over the country. The Auto Channel (www.theautochannel.com) has a Repair & Maintenance icon that leads you to Ask The Experts, lists of frequently asked questions (FAQs) and the opportunity to e-mail your query to Pete the Mechanic. The C.A.R. Show Site (www.thecarshow.com) is the site of a radio program that provides on-the-air automotive diagnosis for listeners. If you don't get the program in your area, the site has an e-mailbox (carshow@toledolink.com) that will get you an answer.

Web Sites

Go to a manufacturer's Web site to learn about its parts, tools or equipment. You may find that there's an e-mail address for technical questions, or a hotline phone number. In most cases, there's also useful tech service information right at the site. Examples:

- **Cooper Automotive**'s many brands include Moog suspension parts, Precision universal joints and Wagner brakes. Its Web site (www.moogauto.com) provides Tech Tips for each brand. You'll find a lot of answers to common service problems in the area covered by the brand's parts.
- **A.E. Clevite**, a manufacturer of engine bearings, offers several services at its site (www.engineparts.com). It has an area called Motorhead Heaven, which leads you to Paging Dr. Dipstick for answers to FAQs, and an e-mail address for special problems. The Tech Stuff section has a lot of information on engine overhaul work, including profusely illustrated instructions for installing engine bearings.
- **Turn** to www.bwdautomotive.com for the conglomerate that includes Borg Warner transmissions and Niehoff ignition. Under Things You Should Know, in the We Can Help area, you'll find Tech Tips by make and year of car.
- **The maker of SunPro** diagnostic equipment for Saturday mechanics has tips on using testers (www.actron.com). It also has a demonstration program of a scan tester that you can download, so you can do a "virtual tryout" of the tool before you buy one.
- **Doing high-performance** upgrades to your car? If you're considering or using Edelbrock parts, the company's Web site (www.edelbrock.com) has lots of tech help, even a detailed report on setting up its Performer series of carburetors.

An excellent list of Web sites (with links) for automotive aftermarket parts, tools and equipment companies is maintained by *Automotive Week*, a weekly newsletter for people who work in the industry. At its Web site, www.auto-week.com, go to Hot Links to get the list.



Do A Web Search

Even if you haven't got a clue, do a Web search. You might be pleasantly surprised. It's often worthwhile to start with the automotive section of any search engine and look for any specifics in which you may be interested. Searches by makes and specific models of cars often lead you to enthusiast clubs, handy if you're trying to restore an oldie. The more focused your search, the more likely it is to yield good information, of course. But we took a relatively broad term, "rack and pinion steering," and one search engine produced a couple of good, basic illustrated technical articles on this and other types of steering, one from AC Delco, another from a road emergency service. You never know. But there's a lot of information you can get on the Web if you learn how to click and look. PM

Detailing Your Car

BY CLIFF GROMER

It's the Great

American Ritual—washing the car. You get your bucket of soapy water and a sponge, fire up the garden hose and go to work. Your neighbor in the adjoining driveway does the same. But he's assembled a whole array of car care implements, including brushes, cotton swabs, a toothbrush and a plethora of cleaning, conditioning and dressing products. By the time you've dried off the body, slapped a coat of wax on the finish and buffed it out, your neighbor is only up to square two. So you move on to the other Great American Ritual—the backyard barbecue, leaving your neighbor elbow-deep in his bucket of soapsuds.

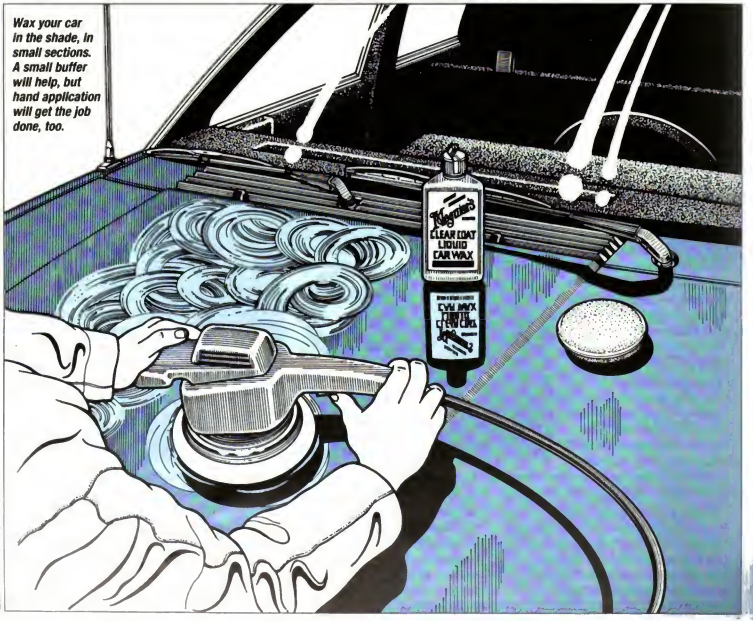
SATURDAY MECHANIC

Later, after scarfing down your fifth hot dog and third ear of corn, you saunter over to your neighbor on the pretext of offering him a barbecued chicken thigh. But you really want to see the kind of job he's doing. His vehicle is about the same vintage and in the same condition as yours, but his car gleams like a jewel. Yours just looks clean.

Degree of Difficulty

EASY

What's your neighbor's secret? He went the detailing route—a process that goes beyond the ordinary wash-and-wax job. Detailing is just that—paying close attention to small details. Sure, it takes a lot more time



Wax your car in the shade, in small sections. A small buffer will help, but hand application will get the job done, too.

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Advertisement

SEXUAL HEALTH

Most men will have an isolated erection problem at some time in their lives, but for others it happens more frequently. If the inability to respond naturally to your partner has become a recurring problem, you may be suffering from a treatable medical condition called erectile dysfunction (E.D.), also known as impotence. The following questions and answers are designed to give you a brief introduction to the causes of E.D. and the various treatment options available. If you believe you are suffering from E.D., or want to know more about the condition, talk to your doctor or other healthcare professional.

ERECTILE DYSFUNCTION: WHAT EVERY MAN SHOULD KNOW

WHAT IS E.D.?

Erectile dysfunction is the consistent inability to achieve and/or maintain an erection sufficient for satisfactory sexual activity. That means not just an occasional problem, but one that has been occurring repeatedly for a period of time. It's a widespread condition, shared by approximately 30 million men in the United States.

WHAT CAUSES E.D.?

It was once believed that E.D. is all in your head, or just an inevitable result of getting older. Actually, the majority of E.D. cases are associated with physical conditions or events, including some that are age-related. The most common risk factors for E.D. include:

- *Diabetes, high blood pressure, hardening of the arteries, or high cholesterol*
- *Injury or illness, such as spinal cord injury, multiple sclerosis, depression, stroke, or surgery for the prostate or colon*
- *Medications that may bring about E.D. as an unwanted side effect*
- *Cigarette smoking or alcohol/drug abuse*
- *Psychological conditions, such as anxiety and stress*

If you want to know more about E.D., talk to your doctor.

CAN ERECTILE DYSFUNCTION BE TREATED?

Yes. The good news is that, regardless of the cause, the vast majority of E.D. cases are treatable. Patients have a variety of treatment options from which to choose, including oral medication, hand-held vacuum pumps, self-administered injections, pellet suppositories, and surgical implants.

CAN ANYONE USE THESE TREATMENTS?

It's important to remember that these treatments are not for everyone, but only for men diagnosed with E.D. You and your doctor can determine the appropriate treatment for you.

HOW DO I KNOW IF I HAVE E.D.?

If you have erection problems, you probably already know it. But before your condition can be treated, you need to get a diagnosis from your doctor. There is no need to be embarrassed or ashamed when discussing E.D. with your doctor. He or she has probably diagnosed and treated E.D. many times but may not have discussed it with you out of respect for your privacy. Your doctor can provide you with understanding, support, and best of all, information.

To diagnose E.D., doctors typically ask a few specific questions and give a routine physical exam. This should help your doctor arrive at a diagnosis.

Based on this information, you and your doctor will decide on the treatment that is best for you.

REMEMBER:

E.D. is a common medical condition.

It's not an inevitable result of growing older.

E.D. is treatable with a variety of methods.

Only your doctor can prescribe the appropriate treatment.

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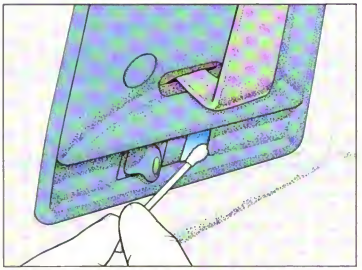

Use a Q-tip to scour interior recesses that have collected dust.

and effort, but the results can be nothing short of eye popping.

Professional detailers have developed their own tricks of the trade for everything from vehicle washing to cleaning windows to getting ventilation grilles looking supercrisp. To get their results, use products designed for specific areas—wheels, trim, windows, etc. Name-brand products are a safe bet. Be sure to read labels to get the best finish.

Where To Start

The interior is a good starting point, so the dust and dirt you brush out won't settle on a pristine exterior. Remove any floor mats and give the carpeting and upholstery a good vacuuming. Also vacuum the dash and rear parcel shelf. Move the front seats full fore and aft to get to all the accumulated dirt and loose change. If the carpets are clean except for a minor stain or two, use a foaming cleaner to get them out. Saturate the stain with cleaner, working it in with a damp sponge. Let it sit awhile and then blot it out with paper towels or a dry cotton cloth. Repeat if necessary, and then go over the area with a damp sponge before final blotting. Don't oversaturate the carpet and risk getting mildew.

You can repair burns and holes in your carpet by cutting out the offending area with a razor blade or scissors. Then cut a similar-size piece from a hidden spot, such as underneath the seat, and cement it in place using a water-resistant adhesive. Blend in the repair by brushing the nap.

Wash the floor mats, if they're rubber, and apply a dressing that does not leave a slippery finish, for obvious reasons.

Clean interior hard surfaces with a damp cloth and a mild all-purpose cleaner such as Simple Green, diluted about 10:1. If you have vinyl-covered seats, use a conditioner made for that material. Avoid products that give a high-gloss, slippery surface, so passengers won't feel like they're on a roller coaster. If you have leather upholstery, dress the surfaces with a leather conditioner. Never use a vinyl product on leather.

Worn or torn areas of vinyl can be repaired using kits made for this purpose that are available at auto supply stores. Repairs are made with a patch that lets you match the color and grain of your upholstery. Worn areas of leather can be touched up with dyes or a high-grade shoe polish. Just make sure you match the color as closely as possible.

A dampened toothbrush can remove wax deposits from exterior trim.

The dash presents a special challenge, with buttons, crevices and bezels that you can't get to with a cleaning rag. You can blast dust and dirt from these areas by using small cans of compressed air made for cleaning camera and computer equipment. Cotton swabs also work well here. Pay attention to the cleaning products you use on your dash. If your dash has a flat finish, don't use a product on it that will leave you facing a shiny gloss.

Clean air vent grilles with cotton swabs and brighten them up by misting on some spray-on vinyl/rubber dressing or accent spray—just a touch. You can also use these products to cover up light scuff marks on wood trim. Spray the stuff on a soft towel and then apply it to the wood.

Clean glass or plastic gauge lenses with a glass or plastic cleaner, not wax. Pull off any removable knobs to clean the bezels underneath. Ever wonder where the haze on the inside of your windshield comes from since you don't smoke? It consists of plastisols given off as the plastics used in many new cars slowly cure. Not to worry—a good glass cleaner should remove it. If your windows are really cruddy, you may have to resort to stronger measures, such as scrubbing with 4-ought steel wool.

A Word Of Caution

If you have aftermarket window tint film, it may be degraded by cleaners that contain ammonia or vinegar. Factory tinting is in the glass and is not affected by these cleaners. One trick used by some detailers for the final touch on window glass is to rinse it down with seltzer and do a final wipe with a ball of crumpled newspaper.

When it comes to first impressions, nothing makes a hit like a jewel finish. But this is possible only after any paint problems are corrected. Just about all finishes today are a 2-step (color) basecoat and a protective clearcoat. The top clearcoat is only about 2-3 mils thick, and when it gets scratched or abraded it refracts light and the color coat underneath doesn't shine through clearly. It's like looking through a scratched or foggy lens.

To evaluate your paint, first wash your vehicle. Work in the shade and make sure the surface is cool. Use a carwash soap, not a household detergent, and work in sections, from the top down. The lower panels tend to accumulate more abrasive dirt. To do a final rinse, remove the spray head from the hose and flood the finish. The water will tend to run off in sheets, minimizing spotting. Dry with a good-quality chamois or

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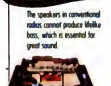
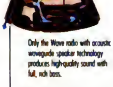


The speakers in conventional radios cannot produce lifelike bass, which is essential for great sound.



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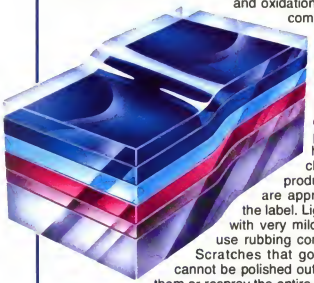
How It Works: Clearcoat Paint

Most modern cars use a clearcoat paint system. The pigmented layer of paint, whether a solid color, metallic or pearlescent, is covered with a layer of clear paint to provide a higher gloss and a "deeper" look. So far so good.

But the surface of any paint, even clearcoat, is vulnerable to scratches and oxidation. In the past, abrasive rubbing compound could be used to polish out these imperfections. Clearcoat is thinner, and using abrasives is trickier. Removing too much paint will leave the pigment layer exposed, necessitating a respray with more clearcoat. The recommended procedure for oxidation and haze is to use a chemical cleaner or cleaner wax. Look for products that specifically say they are appropriate for clearcoat paint on the label. Light scratches can be buffed out with very mild polishing compound. Do not use rubbing compound on a clearcoat finish. Scratches that go through the clearcoat layer cannot be polished out. You'll either have to live with them or respray the entire panel.



a soft thick-nap terry cloth towel.

Don't forget the wheel wells. Get the crud out with an all-purpose cleaner and a good high-pressure dousing. After you've finished washing your car, apply a vinyl dressing to add some snap to the wells.

Wash the wheels (make sure they're cool) with a brush made for this purpose, but do not use acid-based cleaners on polished alloy wheels or wheels that are clearcoated. You can use these cleaners on rough-textured alloy wheels. Chrome wheels can be gleamed up with metal polish or glass cleaner.

After washing the car, inspect the paint. Stains and scratches can be attacked with a good clearcoat-safe cleaner. The worse the problem, the more aggressive the cleaner needed. Start off with the least abrasive product and gradually move to coarser cleaners as required. Then machine buff.

Polishing and/or waxing is next. Be sure to include doorjambs, and the areas beneath door hinges and behind bumpers. Minor blemishes may be neutralized by wrapping a cotton cloth around your index finger and burnishing the polish into the finish. Polish not only gives the finish its gloss, but it feeds the paint with oils to prevent it from drying out. Polymers in the polish fill in minute scratches in the clearcoat layer, restoring its clarity. If you machine-buff the polish/wax to a high luster, go with an orbital rather than a rotary model, which would be more likely to burn the paint. Treat the plastic chrome on today's cars as if it were a painted surface and protect it with a light coat of wax.

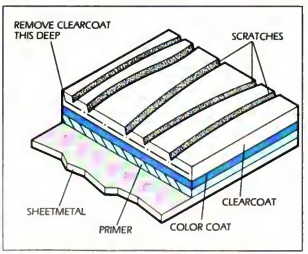


ILLUSTRATION BY RUSSELL J. VON SAUERS

Minor scratches can be polished off with clearer waxes or mild polish.

Avoid getting wax or polish on rubber and flat black plastic areas (clean them with a nongloss product), door handles and emblems. If you do get a wax stain on rubber trim, spray it with a mist-and-wipe product and wipe it down with a terry cloth towel. If that doesn't do the trick, this usually works: Microwave some peanut butter and apply it to the stain with a soft toothbrush. Peanut butter's oils dissolve the wax and it's abrasive enough to lift the stain (but it can stick to the roof of your car).

If you get a polish/wax residue around emblems or in crevices, break out the cotton swabs and toothbrushes. It's important that you first wet the area with a mist-and-wipe product such as Meguiar's Quick Detailer. Never brush on a dry surface.

Moving underhood, protect electronic components by wrapping them in plastic. Then spray on a diluted all-purpose cleaner, hosing it off with light water pressure.

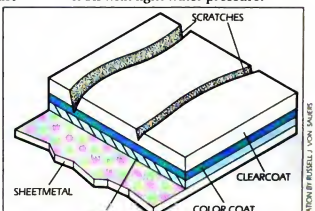


ILLUSTRATION BY RUSSELL J. VON SAUERS

Scratches that go through the clearcoat into the pigment must be repaired professionally.

Vinyl/rubber protectant will dress up nonmetal areas. Let it soak in if you like the glossy look, or wipe it on and off for a more matte finish.

All that's left now are the tires. Clean them first—whitewall tire cleaner works even on blackwalls—and then apply tire dressing. Here again, to get a gloss finish let the product soak in, or for a matte look wipe it on and off with a cotton cloth. Be sure the tires are dry before driving off, or you'll spatter your nice shiny finish. And maybe even your neighbor. PM

TECHNOLOGY UPDATE

How to make your car invisible to radar and laser

Rocky Mountain Radar introduces a device guaranteed to make your car electronically "invisible" to speed traps—if you get a ticket while using the product, the manufacturer will pay your fine!

■ *The Phazer will "jam" both radar and laser guns, preventing police from measuring your speed.*

If your heart doesn't skip a beat when you drive past a speed trap—even if you aren't speeding—don't bother reading this. I can't tell you how many times that has happened to me. Driving down the interstate with my cruise control set at eight miles over the limit, I catch a glimpse of a police car parked on the side of the road. My heart skips a beat and for some reason I look at my speedometer. After I have passed the trap, my eyes stay glued to my rear view mirror, praying the police officer will pass me up for a "bigger fish."

It seems that as speed-detection technology has gotten more and more advanced, speeding tickets have become virtually unavoidable. And although devices exist that enable motorists to detect these speed traps, they are outlawed in many states... including mine.

The solution. Today, Rocky Mountain Radar offers drivers like me a perfect solution—the Phazer. Combining a passive radar scrambler with an active laser scrambler, the Phazer makes your automobile electronically "invisible" to police speed-detecting equipment.

The radar component works by mixing an X, K or Ka radar signal with an FM "chirp" and bouncing it back at the squad car by way of a waveguide antenna, effectively confusing the computer inside the radar gun. The laser component transmits an infrared beam that has the same effect on laser Lidar units.

Shown actual size, the Phazer is only 3"W x 4"L x 1.5"H!

Perfectly legal. Some radar devices have been outlawed because they *transmit* scrambling radar beams back to the waiting law enforcement vehicle. The Phazer, however, *reflects* a portion of the signal plus an added FM signal back to the police car. This, in effect, gives the waiting radar unit an electronic "lobotomy." Best of all, unless you are a resident of Minnesota, Oklahoma or Washington, D.C., using the Phazer is completely within your legal rights.

HOW TO MAKE YOUR CAR DISAPPEAR

Radar and laser scramblers are devices that foil speed traps by making vehicles electronically "invisible" to police radar. Radar scramblers mix a portion of the radar signal with background clutter and reflect it back to the squad car. This technique, pioneered by Rocky Mountain Radar, creates an unreadable signal that confuses the computer inside the radar gun.

The laser scrambler in the Phazer works in a similar manner. It transmits a special infrared beam with information designed to scramble the laser signal. The result? Readouts on police radar and laser guns remain blank. As far as the police officer is concerned, your vehicle is not

■ *The Phazer makes your car invisible to police radar and lasers or the manufacturer will pay your speeding ticket!*

How it scrambles radar. Police radar takes five to 10 measurements of a vehicle's speed in about one second. The Phazer sends one signal that tells the radar the car is going 15 m.p.h. and another signal that the car is going 312 m.p.h. Because police radar can't verify the speed, it displays no speed at all.

Works with laser, too! The Phazer also protects your vehicle from Lidar guns that use the change in distance over time to detect a vehicle's speed. The Phazer uses light-emitting diodes (LEDs) to fire invisible infrared pulses through the windshield. Laser guns interpret those pulses as a false indication of the car's distance, blocking measurement of your speed.

Range up to three miles. The Phazer begins to scramble both radar and laser signals as far as three miles away from the speed trap. Its range of effectiveness extends to almost 100 feet away from the police car, at which point you should be able to make visual contact and reduce your speed accordingly.

Encourage responsible driving. While the Phazer is designed to help you (and me) avoid speed traps, it is *not* intended to condone excessive speeding. For that reason, within the first year, the manufacturer will pay tickets where the speed limit was not exceeded by more than 30%, or 15 miles per hour, whichever is less.

Double protection from speed traps. If the Phazer sounds good, but you prefer to be *notified* when you are in range of a police radar, the Phantom is for you. The Phantom combines the Phazer (including the Ticket Rebate Program) with a radar detector. It's legal in every state except Minnesota, Oklahoma, Virginia and Washington, D.C. Ask your representative for more details!

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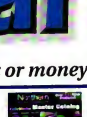

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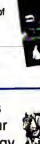

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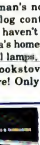

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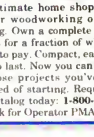

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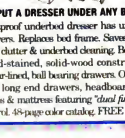

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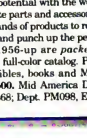

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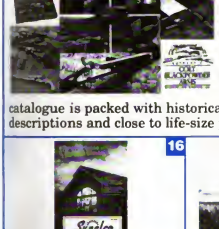

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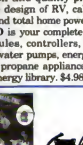

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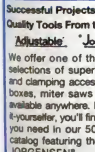

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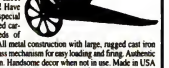

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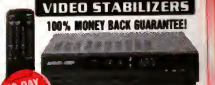

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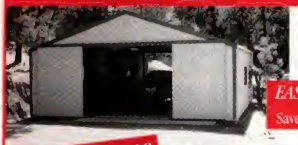

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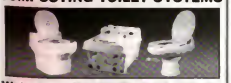

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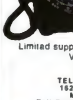

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Think It's New? Think Again!

BY MARY SEELHORST

PRESENT

Generation Ex: New bicycles generate electricity and provide exercise.

Generating

electricity with an exercise bike is a great new idea. Whether you're an environmentalist, an efficiency expert, a rural doctor or even a survivalist, this idea is for you.

Several power-cycle applications exist or are in the works. For instance, a participant at a recent conference on education in developing nations suggested using stationary bicycles to power classroom PCs. It's not so farfetched—fast pedaling can generate about 100 watts, and teachers worldwide have long sought to harness the vast, untapped power of a room full of 10-year-olds.

TURNING AWAY AT CYCLING

Underdeveloped nations may be obvious candidates for bicycle generators—but what about overdeveloped nations? ZAP Power Systems of California, maker of power-assisted bicycles, offers an exercise stand and a battery recharger so you can pedal in your den while recharging the battery for commuting on your electrically power-assisted bicycle. ZAP, by the way, stands for Zero Air Pollution.

Remember—as developed as we like to think we are, about one-third of the world's population is still without electricity. This is a great idea for such a power-hungry world.

PAST

Lost Generation: The same idea was generated 84 years ago and then lost.

If you think generating

electricity with a bicycle is new, think again! Think back to a time before most homes were wired for electricity—if you can. In January 1914, POPULAR MECHANICS rolled out a French exercise bike that also powered a storage battery. A bike combining "exercise with utility" was sure to be of interest to efficiency-minded PM readers.

The flywheel was connected to a small dynamometer, charging a storage battery as the user pedaled. It took about an hour of pedaling to charge the battery, which came in two versions: one for those of average ability, at 12 volts and 12 amps, and another for "stronger persons" with a 12-volt, 25-amp battery.

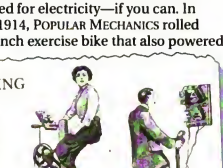
PM reported that the power "can be used for lighting or other domestic purposes" and was capable of "operating small metallic-filament lamps."

Another variation of the French bicycle didn't charge a battery, but still sounds remarkably modern. This one had adjustable resistance, useful for "graduated exercise under the instructions of a physician." It also could measure the speed at which the user pedaled and "give full data as to the amount of energy expended by the user." PM

Power Of The Pedal

NEW FRENCH EXERCISING MACHINES

Two ingenious exercising machines, both of which are operated after the manner of a bicycle and bring the same muscles into play, have recently been brought out in France. One of these combines exercise with utility, while the other is designed to oppose a definite and uniform resistance to the action of the muscles. In the first machine the flywheel is connected with a small dynamo, so that the user, while getting good exercise out of it, is at the



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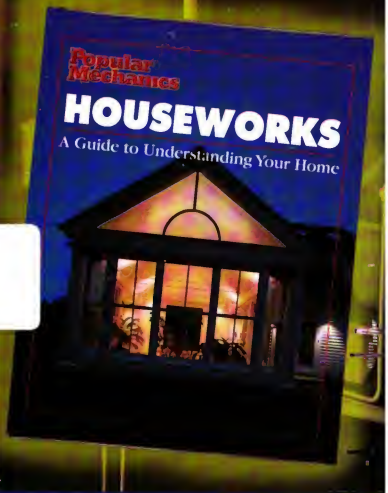

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